

JOURNAL

OF

THE PROCEEDINGS

OF

THE LINNEAN SOCIETY.

1-4
ZOOLOGY.



VOL. I.

LONDON:

LONGMAN, BROWN, GREEN, LONGMANS & ROBERTS,

AND

WILLIAMS AND NORRIS.

1857.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

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JOURNAL OF THE PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

On the Kātēpo, a supposed poisonous Spider of New Zealand ;
extracted from a letter addressed by THOMAS SHEARMAN
RALPH, Esq., A.L.S., to R. Kippist, Esq., Libr. L.S., dated
Wellington, New Zealand, 18th April, 1855.

[Read November 6th, 1855.]

THIS spider is chiefly, if not only, met with under the low scrubby bushes which exist on the sand-hills along the shore ; and is frequent in the neighbourhood of Otaki. They build their retreat under the branches of the shrubs close to the ground, and make no regular net, but irregular galleries of webbing, entangled with bits of leaves and minute fragments of wood ; and judging from the remains of beetles' wings, I suppose that their principal food consists of insects of that class. Their nests are round, and contain from fifty to sixty eggs : when first hatched, the young present a very different appearance from the full-grown spiders. I have several times kept them in a bottle ; but although fed with sand flies, and occasionally with fine fragments of raw beef, on which I have seen them occupied, they entangle each other and so get destroyed : otherwise I have not been able to obtain casts of their skins. At this period they are white, dotted with black spots, there being about six pairs of black dots along the body ; and the legs are banded with black marks. The next stage, or

at least one larger in size, has the body white or grey, with a beautiful orange-coloured band along the whole length of the back. This band is angulated, consisting of a series of squares, placed obliquely and connected at their angles with an edging of white; and on each side of it are two smaller black ones similarly constituted; the limbs are banded with brownish marks. The full-grown spider is of a beautiful black; the golden band is exchanged for an orange-red one of the same shape; but as the successive coats are thrown off, it ceases to be marked at the thoracic end, being visible only towards the tail. The body of the female is larger and rounder. This spider is reputed to be venomous by the natives, who will not touch them on any account; but how far this is really the case I am scarcely able to determine, having only met with one European, who affirmed that he had been bitten by one, and had had an inflamed leg in consequence; but his belief in the cause of this inflammation was founded on native authority. I have hitherto only been able myself to make with them the following experiment:—I placed a lively unhurt mouse in a glass bottle with a fine Katepo, and by dint of shaking the bottle, at length induced the spider to bite the mouse in two places, first on the tail, and secondly on the paw, which latter injury the mouse resented by biting the spider and killing it. The mouse was kept supplied with air, and was found dead within eighteen hours, its body being wet, as though a quantity of urine had been discharged over it. The bottle was quite dry and clear before the spider and mouse were placed in it.

Remarks on some Habits of *Argyroneta aquatica*. By THOMAS BELL, Esq., Pres. L.S.

[Read November 20th, 1855.]

IN consequence of some observations which were made by Mr. Gosse at the last Meeting of the Society, in which he stated his opinion that the *Argyroneta* never fills its bell with air brought from the surface, but that it becomes gradually filled with oxygen evolved from the vegetation casually going on beneath the web, I immediately obtained several specimens of the animal for the purpose of setting the question at rest, and the following are the results of my observations:—

No. 1. Placed in an upright cylindrical vessel of water, in which was a rootless plant of *Stratiotes*; on the afternoon of Nov. 14. By the morning it had constructed a very perfect oval cell filled

with air, about the size of an acorn. In this it has remained stationary up to the present time.

No. 2.—Nov. 15. In another similar vessel, also furnished with a plant of *Stratiotes*, I placed six *Argyronetæ*. The one now referred to began to weave its beautiful web about five o'clock in the afternoon. After much preliminary preparation, it ascended to the surface, and obtained a bubble of air, with which it immediately and quickly descended, and the bubble was disengaged from the body, and left in connexion with the web. As the nest was, on one side, in contact with the glass, enclosed in an angle formed by two leaves of the *Stratiotes*, I could easily observe all its movements. Presently it ascended again and brought down another bubble which was similarly deposited. In this way no less than fourteen journeys were performed, sometimes two or three very quickly one after another, at other times with a considerable interval between them, during which the little animal was employed in extending and giving shape to the beautiful transparent bell, getting into it, pushing it out at one place, and rounding it at another, and strengthening its attachment to the supports. At length it seemed to be satisfied with its dimensions, when it crept into it and settled itself to rest with the head downwards. The cell was now the size and nearly the form of half an acorn cut transversely, the smaller and rounded part being uppermost.

No. 3. The only difference between the movements of this and the former was, that it was rather quicker in forming its cell. In neither vessel was there a single bubble of oxygen evolved by the plant.

The manner in which the animal possesses itself of the bubble of air is very curious, and, as far as I know, has never been exactly described. It ascends to the surface slowly, assisted by a thread attached to the leaf or other support below, and to the surface of the water. As soon as it comes near the surface, it turns with the extremity of the abdomen upwards, and exposes a portion of the body to the air for an instant; then with a jerk it snatches as it were a bubble of air, which is not only attached to the hairs which cover the abdomen, but is held on by the two hinder legs, which are crossed at an acute angle near their extremity; this crossing of the legs taking place at the instant the bubble is seized. The little creature then descends more rapidly, and regains its cell, always by the same route, turns the abdomen within it, and disengages the bubble.

No. 4. Several of them, when I received them, had the hair on

the abdomen wetted, and I placed them on some blotting-paper until they were dry. On returning them to the water, two remained underneath a floating piece of cork, and the hair being now dry retained the pellicle of air which is ordinarily observed. One of the two came out of the water, attached the cork to the glass, and wove a web against the latter, against which it rested about a quarter of an inch above the surface of the water. After remaining there about two days, it resumed its aquatic habits, and like all the others formed its winter habitation. I have now no fewer than ten which have formed their cells, in which they are perfectly at rest, and evidently hibernating.

The general habits of this interesting animal are well described by De Lignac, De Geer, Walckenaer, and others, and an excellent *résumé* of the whole observations is given by the latter author, in his 'Histoire Naturelle des Insectes Aptères.'

Catalogue of the Dipterous Insects collected at Singapore and Malacca by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER, Esq., F.L.S.

[Read January 15th, 1856.]

MR. A. R. WALLACE, so well known for his natural-history researches in the valley of the Amazons, and for the extensive and valuable collections sent home by him from that portion of South America, has now turned his attention to the eastern world, and is actively investigating the natural history of the East Indian Islands, after having spent some months on the Malay Peninsula. A large portion of Mr. Wallace's entomological collections pass into my hands, and being desirous of making his labours scientifically useful, I have requested Mr. F. Walker, who has such an intimate knowledge of the insects belonging to the order *Diptera*, to draw up the following catalogue of the dipterous insects discovered by Mr. Wallace at Singapore and Malacca. My object in so doing is to establish a kind of starting-point for tracing hereafter, when all Mr. Wallace's collections shall have come to hand, the geographical distribution of the *Diptera* in the very interesting portion of the globe which Mr. Wallace is now investigating with such indefatigable zeal. Singapore and Malacca, at the extremity of the Malay Peninsula, are well placed for carrying out the purpose I have in view, being in connexion northwards through the

Burman Empire with the expanded continent of Asia, and southwards in close approximation with that archipelago of splendid islands which run in a chain to the north coast of Australia, and send off a branch northwards through the Philippine Islands to the coast of China, touching there again the mainland of Asia. The present catalogue will be followed very shortly by one detailing the species of *Diptera* discovered in Borneo, the materials for which are now nearly all in this country, and other catalogues will follow until Mr. Wallace's discoveries in the *Diptera* are exhausted. That Mr. Wallace will be able to visit all the islands of the Indian Archipelago is not to be expected; but still, his plan of exploring those which have been but little examined in a natural-history point of view, will open up a large amount of information, which, when combined with the labours of other naturalists who have been working in the same districts, will give sufficient facts for laying down some laws on the geographical distribution of the insects belonging to the Order which forms the subject of the following catalogue. The specimens collected at Singapore and Malacca were taken during the six months commencing with May and terminating with October. Where the altitude of the locality above the level of the sea of any species is known, this will be found noted in the proper place. Figures will be given to illustrate new genera or any very remarkable species.

WILLIAM WILSON SAUNDERS.

14th January, 1856.

Fam. BIBIONIDÆ, *Haliday*.

Gen. PLECIA, *Hoffmansegg*.

1. PLECIA DORSALIS, n. s., mas et fœm. Atræ, thorace rufo, alis nigricantibus.

Male and female. Deep black. Thorax bright pale red. Wings blackish.

Length of the body $2\frac{1}{2}$ – $3\frac{1}{2}$ lines; of the wings 7–8 lines.

The totally red thorax of this species distinguishes it from *P. fulvicollis*, Wied., and from *P. ignicollis*, Walk.

Singapore and Mount Ophir.

Fam. CULICIDÆ, *Haliday*.

Gen. CULEX, *Linn.*

2. *Culex splendens*, Wied. *Auss. Zweifl.* i. 3. 3.

Singapore. Inhabits also Java.

3. *Culex fuscus*, Wied. *Auss. Zweifl.* i. 6. 9.

Malacca. Inhabits also Hindostan.

4. *CULEX ANNULIPES*, n. s., fœm. Obscurè fuscus, thoracis abdominisque lateribus albo-punctatis, pedibus albo-cinctis, alis sublimpidis venis fusco-ciliatis.

Female. Dark brown. Sides of the thorax and of the abdomen with minute white dots. Legs with numerous white bands. Wings nearly limpid; veins brown, ciliated. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines. Singapore. (Jungle.)

Fam. TIPULIDÆ.

Gen. LIMNOBIA, *Meigen*.

Div. I. *Meig. Zweifl.* i. 131. pl. 5. f. 5.

5. *LIMNOBIA LEUCOTELUS*, n. s., mas. Atra, alis nigricantibus, maculâ discali limpidâ, margine postico subcinereo, apice albo.

Male. Deep black. Wings blackish, with a discal limpid spot; posterior border slightly greyish for rather more than half the length from the base; tips white. Length of the body 6 lines; of the wings 12 lines. Singapore.

6. *LIMNOBIA PLECTIOIDES*, n. s., fœm. Atra, thorace pallidè rufo, alis nigricantibus.

Female. Deep black. Thorax pale red. Wings blackish. Length of the body 7 lines; of the wings 12 lines. Singapore.

Div. L. *Meig. Zweifl.* i. 132. pl. 5. f. 4.

The structure of the wing-veins in the above division is almost, but not quite, identical with that of the following species.

7. *LIMNOBIA DICHROA*, n. s., fœm. Atra, antennis ferrugineis basi apiceque nigris, abdomine luteo, basi fasciâque latissimâ posticâ nigris, pedibus testaceis, femoribus tibiisque apice tarsisque nigris, alis fuscescentibus costâ testacâ.

Female. Deep black. Antennæ ferruginous, black at the base and at the tips. Abdomen luteous, black at the base and with a very broad black band beyond the middle. Legs testaceous; tarsi and tips of the femora and of the tibiæ black. Wings brownish, testaceous at the base and along the costa. Length of the body 9 lines; of the wings 16 lines.

Mount Ophir.

Gen. CTENOPHORA, *Fabr.*

8. *CTENOPHORA CHRYSOPHILA*, n. s., fœm. Lutea, abdominis apice nigro, pedibus pallidè luteis, femoribus apice tibiis tarsisque nigris, alis flavescens-
tibus apice nigris margine postico interruptè nigricante.

Female. Bright luteous. Abdomen black towards the tip. Legs pale luteous; tibiæ, tarsi, and tips of the femora black. Wings yellowish, black towards the tips, irregularly and interruptedly blackish along the posterior border. Length of the body 8 lines; of the wings 16 lines.

Singapore.

Fam. STRATIOMIDÆ, *Haliday*.Gen. PTILOCERA, *Wied.*

9. *Ptilocera quadridentata*, *Fabr. Syst. Antl.* 86. 33. (Stratiomys.)
Malacca and Singapore. Inhabits also Java, Sumatra, and the Philippine Islands.

Gen. STRATIOMYS, *Geoffroy*.

10. *Stratiomys Lutatus*, *Walk. Cat. Dipt.* pt. 3. 532.
Malacca.

Gen. CLITELLARIA, *Meigen*.

11. *Clitellaria bivittata*, *Fabr. Syst. Antl.* 79. 5. (Stratiomys.)
Singapore. Inhabits also Java and Sumatra.
12. *Clitellaria varia*, *Walk. Cat. Dipt.* 2nd Ser. pt. 1. 63.
Malacca. Inhabits also Java.

13. CLITELLARIA FLAVICEPS, n. s., fœm. Nigra, capite flavo, thorace cinereo trivittato, scutello bispinoso, abdomine purpureo-cyaneo, alis cinereis apud costam nigricantibus.

Female. Black. Head pale yellow. Antennæ a little shorter than the thorax. Thorax a little narrower in front, with three grey stripes. Scutellum with two stout spines. Abdomen purplish blue; disk beneath hoary. Wings dark grey, blackish along the costa; veins black. Halteres whitish.

Var. β. Smaller. Spines of the scutellum and tarsi whitish, with black tips. Length of the body $2\frac{1}{2}$ – $3\frac{1}{2}$ lines; of the wings 5–7 lines.

Singapore.

Gen. CYCLOGASTER, *Macquart*.

14. CYCLOGASTER RADIANS, n. s., fœm. Nigra, capite nitido, antennis fulvis aristâ albidâ, thorace cinereo radiis quinque nigris, abdomine subrotundo, tarsis albidis, alis cinereis.

Female. Black, rather broad. Head shining. Antennæ tawny, with a pubescent white arista which is as long as the preceding part. Thorax cinereous, with five black rays, three in front and one on each side. Scutellum obconical, prominent. Abdomen nearly round, cinereous, with three rows of black spots. Knees and the adjoining part tawny; tarsi whitish. Wings limpid; veins testaceous. Halteres whitish. Length of the body 3 lines; of the wings 5 lines.

Singapore.

Gen. PHYLLOPHORA, *Macquart*.

15. PHYLLOPHORA ANGUSTA, n. s., mas. Nigra, angusta, sublinearis, antennis setaceis basi fulvis, thorace producto cinereo-bivittato, pedibus testaceis, femoribus posterioribus suprâ piceis, alis cinereis, venis halteribusque fuscis.

Male. Black, narrow, nearly linear. Antennæ setaceous, tawny towards the base, a little longer than the head. Thorax elongated, with two cinereous stripes. Scutellum with four very minute spines. Abdomen hardly broader

and not longer than the thorax. Legs testaceous; posterior femora piceous above. Wings cinereous; veins and halteres brown. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Singapore.

Gen. EUDMETA, *Wied.*

16. *Eudmeta marginata*, *Fabr. Syst. Antl.* 63. 3. (Hermetia.)

Singapore. Inhabits also Java, Sumatra, and Hindostan.

Gen. MASSICYTA, n. g. (*Plate I. fig. 1.*)

Corpus longiusculum, sat angustum. *Caput* transversum, breve, thorace vix latius. *Antennæ* graciles, thorace paulò breviores; articulus 1^{us} linearis; 2^{us} longi-fusiformis, 1^o vix longior; 3^{us} acuminatus, minimus. *Thorax* longi-ellipticus. *Abdomen* obclavatum, subpetiolatum, thorace plus duplò longius. *Pedes* graciles. *Alæ* elongatæ, sat angustæ.

Body rather long and narrow. Head transverse, short, very little broader than the thorax. *Antennæ* slender, a little shorter than the thorax; 1st joint linear; 2nd elongate fusiform, very little longer than the 1st; 3rd acuminate, very minute. Thorax elongate elliptical. Abdomen obclavate, subpetiolated, a little more than twice the length of the thorax. Legs slender. Wings rather long and narrow; mediastinal, subcostal, radial and cubital veins, and median veinlet of the usual structure; 1st, 2nd and 4th externo-medial veins complete; 3rd abbreviated; subanal joining the anal at some distance from the border; discal areolet irregularly hexagonal, elongated, narrower towards the tip of the wing.

17. *MASSICYTA BICOLOR*, n. s., fem. Nigra, antennis basi testaceis apice albis, pectore scutelloque flavis, illo nigro binaudato, abdomine testaceo fasciato, pedibus flavis, femoribus anterioribus tibiisque posticis fusco fasciatis, femoribus posticis nigris, alis cinereis, apud costam subluridis.

Female. Black, shining, with testaceous pubescence. Mouth testaceous. *Antennæ* testaceous towards the base, white at the tips. Pectus and scutellum yellow, the former with a large black spot on each side. Abdomen with testaceous bands. Legs yellow; hind femora black; anterior femora and hind tibiæ with brown bands. Wings grey, with a slight lurid tinge along the costa; veins black. Halteres pale yellow. Length of the body 6–7 lines; of the wings 10–12 lines.

Singapore.

Gen. SARGUS, *Fabr.*

18. *Sargus longipennis*, *Wied. Auss. Zweifl.* ii. 34. 11.

Malacca. Inhabits also Java.

19. *SARGUS LURIDUS*, n. s., mas. Ferrugineus, capite pectoreque testaceis, antennis fulvis, abdominis segmentis testaceo-fasciatis, apice nigro, pedibus testaceis, tibiis posticis apice nigris, tarsis posticis nigris apice albidis, alis luridis apice fuscis.

Male. Ferruginous. Head and pectus testaceous. *Antennæ* tawny. Abdomen black towards the tip; a testaceous band on the hind border of each

segment. Legs testaceous; hind tibiæ black towards the tips; hind tarsi black, with whitish tips. Wings lurid, brown towards the tips; veins brown. Halteres testaceous. Length of the body 7 lines; of the wings 14 lines.

Singapore.

Fam. TABANIDÆ, *Leach*.

Gen. TABANUS, *Linn*.

20. *Tabanus univentris*, *Walk. Cat. Dipt.* pt. 1. 151.

The description in the above reference will not well apply to the two following varieties of this species.

Var. 1. Female. Brown. Head testaceous in front and beneath. Thorax with two testaceous stripes. Abdomen ferruginous, tawny beneath and with a dorsal stripe of tawny triangular spots. Legs blackish; femora and tibiæ partly testaceous. Wings dark grey.—*Var. 2.* Like *Var. 1.* Abdomen blackish above, with a dorsal stripe of testaceous spots.

Mount Ophir. Inhabits also Borneo.

21. *TABANUS PARTITUS*, n. s., fœm. *Nigricans, subtus albidus, antennis fulvis apice nigris, thorace cinerascente cano-quadrivittato, abdomine piceo albidotrivittato, pedibus testaceis, femoribus tibiisque apice tarsisque nigricantibus, alis subcinereis.*

Female. Blackish; underside and head behind with whitish tomentum. Antennæ dull tawny, black towards the tips; angle of the 3rd joint minute and obtuse. Thorax greyish, with four hoary stripes. Abdomen piceous, with three whitish stripes. Legs testaceous; tarsi and tips of the femora and of the tibiæ blackish. Wings greyish, stigma and veins black; fore branch of the cubital vein simple, nearly straight. Length of the body 6 lines; of the wings 10 lines.

Singapore.

Note.—*T. rubidus*, *Wied.*, is very closely allied to the above species, but may be distinguished from it by the following characters.

T. rubidus. Front with the callus quite entire. Antennæ blackish. Middle stripe of the abdomen composed of triangular spots. Wings greyish.

T. partitus. Smaller. Front with the callus almost interrupted. Antennæ pale tawny, with darker tips. Middle stripe of the abdomen entire, parallel. Wings quite limpid.

Gen. CHRYSOPS, *Meigen*.

22. *Chrysops dispar*, *Fabr. Syst. Anth.* 112. 5.

Mount Ophir and Malacca. Inhabits also Hindostan and Java.

Fam. ASILIDÆ, *Leach*.

Subfam. DASYPOGONITES, *Walk*.

Gen. DISCOCEPHALA, *Macquart*.

23. *DISCOCEPHALA DORSALIS*, n. s., fœm. *Nigricans, thorace subgibboso,*

lateribus pectoreque testaceis, pedibus posticis longiusculis sat validis, tibiis posticis subarcuatis, alis subcinereis apice obscurioribus.

Female. Blackish. Thorax somewhat gibbous; sides and pectus testaceous. Hind legs rather long and stout; hind tibiæ somewhat curved. Wings greyish, rather darker at the tips; veins black. Length of the body 5 lines; of the wings 12 lines.

Malacca.

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

24. *Laphria Reinwardtii*, *Wied. Auss. Zweifl.* i. 503. 7.

Malacca. Inhabits also Java and Sumatra.

25. *LAPHRIA NOTABILIS*, n. s., mas et fœm. Nigra, capite thoracisque maculis quatuor transversis lateralibus auratis aut albis, abdominis lateribus albo-maculatis, pedibus pallidè flavis aut albis, femoribus tibiisque apice tarsisque nigris, alis fuscis basim versus sublimpidis.

Male and Female. Black. Head with pale gilded or white tomentum. Face convex towards the epistoma. Mystax with a few black bristles. Proboscis straight, porrect, linear. Third joint of the antennæ slender, linear, about twice the length of the 1st and 2nd together. Thorax with two transverse marks on each side of gilded or white tomentum; scutellum, sides of the hind part of the thorax, and spots on the pectus of the same hue. Segments of the abdomen with a white spot and a few black setæ on each side. Legs pale yellow or white, with hairs of the same hue and with a few black setæ; coxæ, tarsi, and tips of the femora and of the tibiæ black. Wings dark brown, almost limpid towards the base which is brown. Halteres pale yellow or whitish. Length of the body 7-9 lines; of the wings 14-18 lines. Malacca and Mount Ophir.

26. *Laphria Vulcanus*, *Wied. Auss. Zweifl.* i. 514. 25.

Malacca. Inhabits also Java.

27. *Laphria alternans*, *Wied. Auss. Zweifl.* i. 511. 20.

Singapore. Inhabits also Java.

28. *LAPHRIA ORCUS*, n. s., fœm. Nigra, nigro-hirsuta, scutello nigro-cyaneo, abdomine pedibusque nigro-purpureis, alis nigricantibus areolarum discis pallidioribus, halteribus albidis.

Female. Black, with black hairs and bristles. Face slightly convex. Mystax with numerous black bristles, extending over the whole surface. Scutellum dark blue. Abdomen and legs dark purple, the latter with whitish hairs on the coxæ. Wings blackish; disks of several of the areolets much paler; veins black. Halteres whitish. Length of the body 8 lines; of the wings 14 lines.

Malacca.

29. *Laphria aurifacies*, *Macq. Dipt. Exot. Suppl.* iii. 22. 33. pl. 2. f. 5.

Singapore and Malacca. Inhabits also the Moluccas.

30. *Laphria elegans*, *Walk. Cat. Dipt.* 2nd Ser. 551. 126.

Mount Ophir. Inhabits also Hindostan.

31. *LAPHRIA BASIFERA*, n. s., fœm. Obscurè nigra, capite albido tomentoso, mystace nigro, antennarum articulo 3° fusiformi, thorace cano-sexvittato, abdominis lateribus albido-maculatis, apice compresso, alis subcinereis basi sublimpidis costæ dimidio apicali fusciscente.

Female. Dull black. Head with whitish tomentum and hairs. Face slightly convex towards the epistoma. Mystax with several black bristles. Proboscis lanceolate, stout, straight. Third joint of the antennæ fusiform, as long as the 1st and the 2nd. Thorax with six hoary stripes; the middle pair parallel, linear, very slender and almost contiguous. Abdomen with whitish spots along each side, compressed at the tip. Legs with whitish hairs and with black bristles. Wings greyish, almost limpid towards the base, brownish along the apical part of the costa; veins black. Length of the body 6 lines; of the wings 12 lines.

Singapore.

This may be the female of the following species.

32. *LAPHRIA RADICALIS*, n. s., mas. Nigra, capite argenteo, mystace nigro, antennarum articulo 3° lineari, thorace strigis quatuor lateralibus transversis vittisque duabus intermediis albidis, abdominis lateribus albido-maculatis, ventre testaceo, alis nigro-fuscis dimidio basali limpidis.

Male. Black. Head beneath with whitish hairs. Face flat, with silvery-white tomentum. Mystax with a few black bristles. Proboscis linear, rather slender. Third joint of the antennæ linear, a little longer than the 1st and the 2nd. Thorax with two transverse whitish marks on each side, and with two whitish middle stripes which are broader and further apart than those of *L. basifera*. Pectus with testaceous whitish tomentum. Abdomen with a row of whitish spots along each side; underside testaceous except at the tip. Legs with blackish hairs; femora with testaceous hairs. Wings blackish brown, limpid for almost half the length from the base; veins black. Halteres whitish. Length of the body 5 lines; of the wings 10 lines.

Mount Ophir, at the height of 4000 feet.

33. *LAPHRIA INAUREA*, n. s., fœm. Obscurè nigra, capite, thoracis lateribus, pectore abdominique marginibus fulvo-tomentosis, mystace nigro, antennarum articulo 3° longi-fusiformi, thorace cinereo-bivittato, abdomine ferrugineo, apice nigro, alis obscurè fuscis basi pallidioribus.

Female. Dull black. Head, sides of the thorax, pectus, and hind borders of the abdominal segments with tawny tomentum. Face slightly convex towards the epistoma. Mystax with a few black bristles. Third joint of the antennæ very elongate-fusiform, longer than the 1st and the 2nd. Thorax with two parallel cinereous stripes. Abdomen ferruginous, black and shining towards the tip; underside somewhat cinereous. Legs with tawny hairs. Wings dark brown, somewhat paler towards the base; veins black. Halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

Singapore.

34. *LAPHRIA BASIGUTTA*, n. s., mas. Nigra, capite aureo, mystace nigro, antennarum articulo 3° lineari, thorace abdominique fulvo-tomentosis, alis nigricantibus basi sublimpidis.

Male. Black. Face almost flat, with pale gilded tomentum. Mystax with

very few black bristles. Proboscis linear, more slender than that of *L. radicalis*. Third joint of the antennæ linear, a little longer than the 1st and the 2nd, more slender than that of *L. radicalis*. Thorax with dull tawny tomentum; pectus more cinereous. Abdomen more slightly tawny. Legs with cinereous hairs and black bristles. Wings blackish, almost limpid towards the base; veins black. Halteres tawny. Length of the body 5 lines; of the wings 9 lines.

Singapore.

35. *LAPHRIA FUSIFERA*, n. s., fœm. Nigra, cinereo-tomentosa, capite albido, mystace nigro, antennarum articulo 3^o fusiformi, thoracis vittis duabus pectoreque canis, abdomine apicem versus rufo, alis subcinereis apud costæ dimidium apicale fusciscentibus.

Allied to *L. crassipes*, Fabr. *Female*. Black, with greyish tomentum. Head whitish in front, with white hairs beneath; face very convex towards the epistoma. Mystax with a few black bristles. Proboscis oblique, ascending, stout, straight, lanceolate. Third joint of the antennæ fusiform. Thorax with two hoary stripes; sutures and pectus hoary. Abdomen pale red towards the tip which is compressed. Legs with whitish hairs and black bristles. Wings greyish, brownish for half the breadth along the apical half of the costa; veins black. Length of the body 6 lines; of the wings 12 lines.

Singapore.

36. *LAPHRIA SOBRIA*, n. s., fœm. Nigra, fulvo-tomentosa, capite albo, mystace nigro, abdominis apice glabro, tibiis ferrugineis, alis cinereis basi sublimpidis.

Female. Black. Face flat, with shining white tomentum. Mystax with a few black bristles. Proboscis straight, slender, linear. Thorax and abdomen with tawny tomentum, the latter bare and shining towards the tip. Pectus more cinereous. Tibiæ somewhat ferruginous. Wings dark cinereous, almost limpid towards the base; veins black. Halteres testaceous. Length of the body 5 lines; of the wings 10 lines.

Singapore.

37. *LAPHRIA PLANA*, n. s., mas. Nigra, cinereo-tomentosa, capite albido, mystace nigro, antennarum articulo 3^o elliptico, pedibus fulvis, alis cinereis, halteribus albidis.

Male. Black, with cinereous tomentum. Face whitish, flat. Mystax with very few black bristles. Proboscis straight, porrect, slightly lanceolate, somewhat short. Third joint of the antennæ elliptical, a little shorter than the 1st. Pectus hoary. Legs tawny. Wings grey; veins black. Halteres whitish. Length of the body 4 lines; of the wings 10 lines.

Singapore.

38. *LAPHRIA IMBELLIS*, n. s., fœm. Nigra, cinereo-tomentosa, capite albido, mystace albo, antennis fulvis, thoracis strigis transversis quatuor lateralibus vittisque tribus intermediis canis, abdominis segmentis maculis lateralibus albidis, pedibus fusco-fulvis, alis limpidis apice fuscis, halteribus albidis.

Female. Black, with cinereous tomentum. Head with white hairs beneath. Face whitish, slightly convex towards the epistoma. Mystax with a few

white bristles. Proboscis lanceolate, short, straight, porrect. Antennæ tawny. Thorax with two transverse hoary marks on each side, and with three indistinct hoary stripes. Pectus whitish. Abdominal segments with a transverse whitish spot on each side of the hind border. Legs tawny, with paler hairs; coxæ black; anterior tarsi towards the tips, hind tarsi at the base, and hind tibiæ brown. Wings limpid, brown at the tips; veins black. Halteres whitish. Length of the body 5 lines; of the wings 10 lines.

Singapore.

Subfam. ASILITES, *Walk.*

Gen. ASILUS, *Linn.*

39. *ASILUS FUSIFORMIS*, n. s., fœm. Niger, cinereo-tomentosus, capite albidio, mystace testaceo, thoracis vittis tribus pectoreque canis, abdominis apice compresso glabro, pedibus rufis, tarsis nigris, femoribus anterioribus nigromaculatis, alis subcinereis.

Female. Black, with cinereous tomentum. Head whitish in front, rather thickly clothed with whitish hairs; a few black bristles behind; face slightly convex towards the epistoma. Mystax with several testaceous bristles. Proboscis stout, straight, lanceolate. Palpi with thick black bristles. Antennæ black. Thorax with three indistinct hoary stripes. Pectus hoary. Abdomen oblanceolate, with whitish and black hairs, compressed, shining, and bare towards the tip. Legs red, very stout, beset with black spines; tarsi except at the base and knees black; a black spot on each of the anterior femora. Wings slightly cinereous; veins black, tawny at the base and along the costa. Halteres testaceous. Length of the body 13 lines; of the wings 24 lines.

Malacca.

40. *ASILUS LINEOSUS*, n. s., fœm. Fuscus, capite subaurato, mystace testaceo nigroque, antennis pedibusque nigris, thorace aureo-quadrivittato, abdomine fulvo-fasciato, apice nigro compresso transversè ruguloso, tibiis luteis apice nigris, alis cinereis.

Female. Dark brown. Head with pale gilded tomentum, clothed beneath with whitish hairs; face convex towards the epistoma. Mystax with several testaceous bristles and with a few more slender black bristles. Proboscis stout, straight, lanceolate. Palpi thickly beset with black bristles. Antennæ black; arista almost thrice the length of the 3rd joint which is fusiform. Thorax with four dull pale gilded stripes; sides and pectus cinereous. Abdomen oblanceolate, with broad fawn-coloured bands, black, shining, compressed and transversely rugulose towards the tip. Legs black, armed with black spines; tibiæ pale luteous, with black tips; onychia pale luteous. Wings cinereous; veins black. Halteres ferruginous. Length of the body 12 lines; of the wings 20 lines.

Singapore.

41. *ASILUS DEBILIS*, n. s., mas. Cinereus, capite flavido-albo, mystace testaceo nigroque, antennis fulvis, thorace fusco-bivittato, abdominis segmentis cano-

fasciatis, pedibus testaceis, femoribus tibiisque apice tarsisque nigricantibus, alis sublimpidis apice nigricantibus.

Male. Cinereous. Head with yellowish-white tomentum, clothed beneath with white hairs; face very slightly convex towards the epistoma. Mystax with a few testaceous, and with still fewer black bristles. Proboscis black, slightly lanceolate, rather slender. Antennæ tawny; 3rd joint and arista black, the latter four times the length of the former which is fusiform. Thorax with two brown stripes. Pectus hoary. Abdomen with a hoary band on the hind border of each segment. Legs testaceous, with very few black bristles; tarsi, except at the base and tips of the femora and of the tibiæ, black; hind femora and hind tibiæ mostly black. Wings nearly limpid, blackish towards the tips; veins black. Halteres testaceous. Length of the body 7 lines; of the wings 14 lines.

Malacca.

42. *ASILUS LATIFASCIA*, n. s., mas. Cinereo-niger, capite albido, mystace testaceo, thoracis vittis quatuor pectoreque canis, abdomine ferrugineo, basi apiceque nigris, pedibus fulvis nigro-variis, alis nigricantibus margine postico fusco.

Male. Black, with a slight cinereous tinge. Head with some whitish hairs beneath. Face whitish, flat. Mystax with many pale testaceous bristles. Proboscis straight, slightly lanceolate. Antennæ black. Thorax with four slight hoary stripes. Pectus hoary. Abdomen ferruginous, black at the base and towards the tip. Legs tawny; tarsi, hind femora, and tips of the posterior tibiæ black; anterior femora black above. Wings blackish, brown along the hind border; veins black. Halteres testaceous. Length of the body 9 lines; of the wings 16 lines.

Singapore.

43. *Asilus Barium*, *Walk. Cat. Dipt.* pt. 2. 426.

Mount Ophir. Inhabits also Ceylon and Sumatra.

Gen. *OMMATIUS*, *Illiger*.

44. *Ommatius Pennus*, *Walk. Cat. Dipt.* pt. 2. 469.

Malacca. Inhabits also Sumatra, Borneo, and Corea.

45. *Ommatius Hecale*, *Walk. Cat. Dipt.* pt. 2. 476.

Singapore.

46. *OMMATIUS GRACILIS*, n. s., mas. Nigro-fuscus, facie atrâ, thoracis lateribus pectoreque canis, pedibus fulvis, femoribus tibiisque apice tarsisque nigris, alis sublimpidis apice cinereis.

Male. Blackish-brown. Face flat, deep black. Proboscis black, rather slender, slightly lanceolate. Antennæ black. Pectus and sides of the thorax hoary. Abdomen dull black. Legs tawny; tarsi and tips of the femora and of the tibiæ black. Wings nearly limpid, dark grey towards the tips; veins black. Halteres testaceous. Length of the body 6 lines; of the wings 10 lines. Mount Ophir.

Fam. LEPTIDÆ, *Westw.*Gen. LEPTIS, *Fabr.*

47. *LEPTIS DECISA*, n. s., mas. Nigra, capite albo, antennis testaceis basi nigris, thoracis callis testaceis, vittis duabus pectoreque canis, abdomine testaceo, vittâ dorsali fasciisque nigris, femoribus testaceis apice nigris, alis sublimpidis fasciâ apiceque fuscis.

Male. Black. Head white in front. Antennæ testaceous, black towards the base. Humeral calli testaceous. Thorax with two hoary stripes; sides and pectus hoary. Abdomen testaceous, with a black dorsal stripe and a black band on the hind border of each segment. Femora testaceous, with black tips; hind femora black for more than half the length from the tips. Wings nearly limpid, pale brown towards the tips, and with a darker brown band which tapers irregularly from the costa to the hind border and crosses the base of the discal arcole; veins black. Halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

Malacca.

Fam. BOMBYLIDÆ, *Leach.*Gen. ANTHRAX, *Fabr.*

48. *ANTHRAX DEGENERATA*, n. s., mas et fœm. Nigra, pectore albido, abdominis lateribus ferrugineis, ventre testaceo, alis subcinereis, pedibus basi testaceis. Mas. Alis basi et apud costam nigro-fuscis. Fœm. Alis plus dimidio basali nigro-fuscis.

Male and Female. Dull black. Head not broader than long. Antennæ small; 3rd joint short-conical; arista somewhat longer than the 3rd joint. Pectus whitish. Abdomen blackish-brown, ferruginous on each side, testaceous beneath. Legs long, slender. Wings greyish; veins black; radial vein curved towards its tip; fore fork of the cubital undulating, parallel to the radial, forming near its base an obtuse angle which emits the stump of a vein; hind fork straight; three nearly straight externo-medial veins; 2nd connected with the 3rd by an undulating and very oblique veinlet; subanal vein near the anal on the border. Halteres testaceous.—*Male.* Hind femora testaceous towards the base; anterior femora dark testaceous. Wings blackish-brown at the base and along the costa.—*Female.* Hind femora testaceous with black tips; anterior femora paler testaceous. Wings blackish-brown for much more than half the length from the base. Length of the body $3\frac{1}{2}$ lines; of the wings 10 lines.

Singapore.

Fam. DOLICHOPIDÆ, *Leach.*Gen. PSILOPUS, *Meigen.*

49. *PSILOPUS CLARUS*, n. s., mas. Viridis, capite cyaneo, facie pectoreque albis, antennis nigris, abdominis segmentis nigro-fasciatis, pedibus testaceis, tibiis posticis apice tarsisque nigris, alis limpidis.

Male. Green. Head bright blue, white in front. Proboscis, legs and halteres

testaceous. Antennæ black; arista as long as the thorax. Pectus white. Abdominal segments with black bands. Legs long; tarsi and tips of the hind tibiæ black. Wings limpid; veins black; fore branch of the præbrachial vein slightly curved; hind branch extending to the border; discal transverse vein rather deeply undulating. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Mount Ophir.

50. *PSILOPUS ROBUSTUS*, n. s., fœm. Purpureo-cyanus, capite purpureo, facie pectoreque albis, antennis pedibus halteribusque testaceis, thorace viridi-vario, abdominis fasciis nigris, tarsis apice nigricantibus, alis subcinereis.

Female. Purplish-blue. Head bright purple, white in front. Proboscis and antennæ testaceous; arista black, full as long as the thorax. Thorax green on each side and in front. Pectus white. Abdomen with black bands. Legs long, pale testaceous; tarsi blackish towards the tips. Wings slightly greyish; veins black; fore branch of the præbrachial vein moderately curved; discal transverse vein moderately undulating. Halteres pale testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

This may be the female of *P. clarus*.

Singapore.

51. *PSILOPUS SUBNOTATUS*, n. s., mas. Cyanus, capite purpureo, facie pectoreque albis, proboscide antennis pedibusque testaceis, thoracis lateribus anticis viridibus, abdomine viridi-cyaneo basi apiceque purpurascente, tarsis apice nigricantibus, alis subcinereis albido-bifasciatis.

Male. Blue. Head purple above, white in front. Proboscis and antennæ testaceous; arista black, nearly as long as the thorax. Thorax green on each side in front. Pectus white. Abdomen greenish-blue, purplish at the base and at the tip. Legs testaceous, rather long; tarsi blackish towards the tips. Wings slightly greyish, with two imperfect whitish bands; hind border white towards the tip; costa interruptedly blackish; veins black; fore branch of the præbrachial vein almost straight; hind branch extending to the border; discal transverse vein almost straight, hardly undulating. Halteres pale testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

Mount Ophir.

52. *PSILOPUS POSTICUS*, n. s., mas. Viridis, proboscide antennis abdominis fasciis pedibusque nigris, tibiis luridis, alis nigris apud marginem posticum sublimpidis.

Male. Dark green. Head above bluish-green. Proboscis and antennæ black; arista nearly as long as the body. Abdomen with black bands. Legs black; posterior tibiæ lurid; fore tibiæ testaceous. Wings black, rather narrow, nearly limpid along the hind border; veins black; fore branch of the præbrachial vein slightly curved; discal transverse vein slightly undulating. Halteres black. Length of the body 2 lines; of the wings 5 lines.

Malacca.

53. *PSILOPUS TENEBROSUS*, n. s., fœm. Purpureo-niger, facie pectoreque albis, abdomine purpureo, pedibus fulvis, femoribus apice tarsisque nigricantibus, alis nigricantibus margine postico fasciâque sublimpidis.

Female. Purplish-black. Head dull black, white in front. Proboscis piceous. Antennæ black; arista rather shorter than the thorax. Pectus white. Abdomen dark purple. Legs tawny; tarsi and tips of the femora blackish. Wings blackish, nearly limpid along the hind border, and at two-thirds of the length with a nearly limpid band which extends from the hind border to the cubital vein; veins and halteres black; fore branch of the præbrachial vein very deeply curved; discal transverse vein almost straight. Length of the body 3 lines; of the wings 6 lines.

Singapore.

Fam. SYRPHIDÆ, *Leach.*

Gen. CERIA, *Fabr.*

54. *Ceria Javana*, *Wied. Auss. Zweifl.* ii. 81. 1.

Malacca. Inhabits also Java.

Gen. ERISTALIS, *Latr.*

55. *Eristalis Amphicrates*, *Walk. Cat. Dipt.* pt. 3. 623.

Malacca. Inhabits also Hindostan, Java, and China.

56. *Eristalis niger*? *Wied. Auss. Zweifl.* ii. 183. 45.

Singapore. Inhabits also Java?

57. *ERISTALIS SINGULARIS*, n. s., fœm. Ater, aristâ nudâ, pedibus posticis subincrassatis, tibiis anterioribus basi testaceis, alis subcinereis apud costæ medium nigricantibus.

Female. Deep black. Head shining in front. Arista bare. Legs shining; hind femora rather thick; hind tibiæ slightly dilated; anterior tibiæ pale testaceous towards the base. Wings greyish, with a blackish tinge along the middle of the costa; veins black. Length of the body 4 lines; of the wings 8 lines.

Singapore.

Gen. HELOPHILUS, *Meigen.*

58. *HELOPHILUS INSIGNIS*, n. s., fœm. Nigricans, capitis lateribus anticis pectorisque fasciis duabus testaceis, antennis ferrugineis, thoracis vittis quatuor, scutello abdominisque fasciis tribus luteis, hujus marginibus subchalybeis, tibiis fulvis apice nigricantibus, alis subcinereis basi subluridis apud costæ dimidium apicale fuscescentibus.

Female. Blackish. Head pale testaceous on each side in front. Antennæ ferruginous. Thorax with four luteous stripes. Pectus with a testaceous band on each side. Scutellum luteous. Abdomen with three luteous bands; 1st broad, interrupted; 2nd narrower than the 1st, broader than the 3rd; hind borders of the segments slightly chalybeous and shining. Tibiæ tawny, with blackish tips. Wings slightly greyish, with a lurid tinge at the base, and a slight brownish tinge along the costa beyond the middle; veins black, tawny towards the costa. Halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

Singapore.

Gen. *XYLOTA*, *Meigen*.

59. *XYLOTA CONFORMIS*, n. s., fœm. *Ænea*, capite femoribusque chalybeis, antennis fulvis, thorace testaceo-bivittato, abdominis fasciis duabus latis interruptis pedibusque testaceis, alis subcinereis.

Female. *Æneous*. Head chalybeous, with whitish tomentum in front, with short white hairs beneath. Proboscis black. Antennæ tawny; arista bare. Thorax with two testaceous tomentose stripes. Pectus with a testaceous band on each side. Abdomen with two broad interrupted testaceous bands. Legs testaceous; femora chalybeous; tarsi with brownish tips. Wings slightly greyish; veins black; stigma brown. Halteres testaceous. Length of the body 5 lines; of the wings 10 lines.

Singapore.

Gen. *MILESIA*, *Latr.*

60. *Milesia macularis*, *Wied. Auss. Zweifl.* ii. 107. 5.

Singapore. Inhabits also Java.

61. *Milesia Reinwardtii*, *Wied. Auss. Zweifl.* ii. 104. 1.

Singapore. Inhabits also Java.

62. *MILESIA VESPOIDES*, n. s., mas. *Atra*, verticis maculâ trigonâ testaceâ, abdominis fasciâ latissimâ luteâ, femoribus posticis extûs apices versus ferrugineis, alis fuscis apice luridis margine postico cinereis.

Male. Deep black. Head with a minute elongate-triangular testaceous spot on the vertex; fore part and humeral calli shining. Abdomen partly clothed with black hairs, with a very broad luteous band which occupies rather more than half the hind part of the 2nd segment and the fore half of the 3rd. Hind femora ferruginous on the outer sides towards the tips. Wings dark brown, lurid towards the tips, grey along the hind border. Halteres pale testaceous. Length of the body 11 lines; of the wings 22 lines. Singapore.

Gen. *SYRPHUS*, *Fabr.*

63. *SYRPHUS CONSEQUENS*, n. s., mas et fœm. Luteus, vertice nigro, antennis nigro-vittatis, thoracis disco chalybeo, abdominis fasciis quatuor atris, femoribus posticis apice neonon tibiis tarsisque posticis nigris, alis subcinereis apud costam subfuscis.

Closely allied to *S. ericetorum*.—*Male and Female*. Pale luteous. Head black and shining on the vertex by the antennæ, pale testaceous in front. Proboscis tawny. Antennæ tawny, with a black dorsal stripe; arista black. Disk of the thorax chalybeous. Abdomen with four deep black bands on the hind borders of the segments. Hind tibiæ, hind tarsi, and tips of hind femora black. Wings slightly greyish, with a brown tinge along the costa; veins black. Halteres pale testaceous.—*Female*. Vertical callus capitate. Length of the body $4\frac{1}{2}$ – $5\frac{1}{2}$ lines; of the wings 10–12 lines.

Singapore and Mount Ophir.

64. *SYRPHUS DUPLEX*, n. s., mas et fœm. Chalybeo-niger, gracilis, antennis maris piceis fœminæ fulvis, abdominis fasciis tribus interruptis testaceis,

femoribus anterioribus testaceis apice nigris, posticis basi testaceis, alis subcinereis.

Male and Female. Chalybeous black, slender. Antennæ of the male piceous, of the female tawny. Abdomen with three dull interrupted testaceous bands, slightly compressed for three-quarters of the length in the male. Legs black; anterior femora testaceous with black tips; hind femora testaceous at the base. Wings greyish; veins and stigma black. Halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

Singapore.

65. *SYRPHUS TRILIGATUS*, n. s., mas. Flavius gracilis, antennis fulvis, thoracis disco chalybeo-nigro, pectore et metathorace nigris, abdominis fasciis quatuor latis quatuorque angustis nigris, femoribus posticis nigro latè fasciatis, tibiis tarsisque posticis nigris, alis subcinereis.

Male. Pale yellow, rather slender. Antennæ tawny. Disk of the thorax chalybeous black. Pectus and metathorax mostly black. Abdomen with eight black bands which are alternately broad and narrow. Hind femora with a broad black band; hind tibiæ and hind tarsi black. Wings greyish; stigma brown; veins black. Halteres pale testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

Mount Ophir.

Fam. MUSCIDÆ, *Latr.*

Subfam. TACHINIDES, *Walk.*

Gen. ECHINOMYIA, *Duméril.*

66. *ECHINOMYIA BREVIPENNIS*, n. s., mas. Nigra, capite anticè albo, frontilibus ferrugineis, scutello abdominisque fasciis testaceis, alis subcinereis parvis basi limpidis.

Male. Black, stout. Head white, with white hairs beneath; front and vertex black, shining; frontalia ferruginous, slightly widening from the vertex to the antennæ; epistoma slightly prominent. Antennæ extending to two-thirds of the length of the face; 3rd joint truncated, not much longer than broad, much broader and shorter than the 2nd; arista stout, tapering from its two indistinct basal joints, full twice the length of the 3rd joint. Scutellum testaceous. Abdomen elongate-oval, longer than the thorax. Wings greyish, rather short, limpid towards the base; veins black, testaceous towards the base; præbrachial vein forming a very slightly acute angle at its flexure, near which it is very deeply curved inward, and is thence straight to its tip which joins the tip of the costal; discal transverse vein straight, parted by much less than its length from the border, and by little more than half its length from the flexure of the præbrachial. Alulæ greyish, with testaceous borders. Length of the body 6 lines; of the wings 9 lines.

Mount Ophir, at the height of 4000 feet.

Gen. TACHINA, *Fabr.*

67. *TACHINA OPHIRICA*, n. s., fœm. Cinerea, latiuscula, capite argenteo, fron-

talibus atris, thoracis vittis quatuor interruptis nigris, scutelli margine abdominisque fasciis canis, alis subcinereis.

Female. Cinereous, rather short and broad. Head hoary, silvery-white above and in front; frontalia deep black, slightly widening from the vertex to the antennæ; facialia without bristles; epistoma hardly prominent. Antennæ extending to about three-quarters of the length of the face; 3rd joint linear, slender, rounded at the tip, about twice the length of the 2nd; arista stout for about half its length, very much longer than the 3rd joint. Thorax with four slender interrupted black stripes; scutellum with a hoary border. Abdomen black, obconical, hardly longer than the thorax; a broad hoary band on the fore border of each segment. Wings slightly greyish; veins black; præbrachial vein forming an almost right and rather well-defined angle from whence it is slightly curved inward to its tip; discal transverse vein hardly curved inward, parted by rather less than its length from the border and from the flexure of the præbrachial. Alulæ white. Length of the body 4 lines; of the wings 8 lines.

Mount Ophir, at the height of 4000 feet.

Gen. MASICERA, *Macquart*.

68. *Masicera tomentosa*, *Macq. Dipt. Exot. Suppl.* 2.

Mount Ophir, at the height of 4000 feet.

69. *MASICERA VICARIA*, n. s., fem. Nigra, longiuscula, capite albo, frontali-
bus atris, thoracis vittis quatuor, lateribus scutello abdominisque fasciis
duabus latis interruptis canis, alis cinereis.

Female. Black, rather long. Head white, with short white hairs beneath and behind; frontalia linear, deep black; facialia without bristles; epistoma not prominent. Eyes pubescent. Antennæ extending nearly to the epistoma; 3rd joint linear, slender, slightly rounded at the tip, about four times the length of the 2nd; arista rather stout for full one-third of the length from the base, very much longer than the 3rd joint. Thorax with four hoary stripes; sides and scutellum hoary. Abdomen elongate-obconical, much longer than the thorax, with two broad interrupted hoary bands. Legs stout. Wings grey; veins black; præbrachial vein forming a rather obtuse angle at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein undulating, parted by very little less than its length from the border and from the flexure of the præbrachial. Alulæ whitish. Length of the body 5 lines; of the wings 9 lines.

Singapore.

Gen. EURIGASTER, *Macquart*.

70. *EURIGASTER MUSCOIDES*, n. s., fem. Nigra lata, capite albedo, frontali-
bus nigris, palpis testaceis, thorace cano nigro-quadrivittato, scutelli apice
fulvo, abdomine cano-fasciato, alis cinereis apud costam fusciscentibus.

Female. Black, broad, with long bristles. Head whitish; frontalia black, linear; facialia without bristles; epistoma not prominent. Eyes pubescent. Palpi testaceous. Antennæ extending to the epistoma; 3rd joint linear, rounded at the tip, full four times the length of the 2nd; arista

slender, very much longer than the 3rd joint. Thorax hoary, with four black stripes. Scutellum tawny towards the tip. Abdomen obconical, hardly longer than the thorax, with a broad hoary band on each segment. Legs slender, hardly setose. Wings grey, brownish in front; veins black; præbrachial vein forming a slightly obtuse angle at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein straight except a slight curve by its hind end, parted by much less than its length from the border, and by rather more than its length from the flexure of the præbrachial. Alulæ white. Length of the body 3 lines; of the wings 6 lines. Singapore.

Gen. ZAMBESA, n. g. (*Plate I. fig. 2.*)

Mas. Corpus longum, angustum, subcylindricum. *Facies* verticalis, subretracta. *Facialia* nuda. *Epistoma* planum. *Palpi* longiusculi, sat graciles. *Antennarum* articulus 3^{us} gracilis, linearis, 2° sexties longior; aristâ gracillimâ. *Oculi* nudi. *Abdomen* lineare, thorace multò longius. *Pedes* longiusculi. *Alæ* sat angustæ.

Male. Body long, narrow, almost cylindrical. Face vertical, slightly retracted towards the base. Facialia without bristles. Eyes remote, bare. Palpi rather long and slender. Antennæ extending to the epistoma; 3rd joint slender, linear, rounded at the tip, six times the length of the 2nd; arista very slender, rather longer than the 3rd joint. Abdomen linear, much longer than the thorax. Legs rather long. Wings rather narrow; costal vein ending at hardly in front of the tip of the wing; brachial vein joining the cubital.

71. ZAMBESA OCYPTEROIDES, n. s., mas. Nigra, capite albo, frontalibus atris, antennarum articulo 3° fulvo, thorace cano nigro-quadrivittato, abdominis fasciis duabus latis interruptis semihyalinis albido-testaceis, femoribus testaceis apice nigris, tibiis piceis, alis limpidis, apice margineque postico cinereis.

Male. Black. Head white, with short white hairs beneath; frontalia deep black, linear. Proboscis testaceous. Palpi black. Third joint of the antennæ tawny. Thorax hoary, with four black stripes, of which the outer pair are very much broader than the inner pair. Abdomen a little narrower than the thorax, with two broad whitish testaceous semihyaline bands which are interrupted above. Femora testaceous, with black tips; tibiæ piceous. Wings limpid, grey towards the tips and along the hind borders; veins black; præbrachial vein forming an obtuse angle at its flexure from whence it is slightly curved inward to its tip, which joins the cubital very near the border; discal transverse vein very slightly curved inward, parted by less than its length from the border, and by more than its length from the flexure of the præbrachial. Alulæ white. Length of the body 5 lines; of the wings 10 lines.

Singapore.

Subfam. DEXIDES, *Walk.*

Gen. DEXIA, *Meigen.*

72. DEXIA DIVERGENS, n. s. (gen. Thelaira, *Desr.*), mas. Cana longa an-

gusta, capite albo, frontalibus atris, probosceide palpis antennisque testaceis, aristâ plumosâ, thorace nigro-quadrivittato, abdomine testaceo semihyalino, vittâ fasciisque nigris, pedibus longis testaceis, tarsis nigris, alis subcinereis.

Male. Body hoary, long, narrow, with long black bristles. Head white; frontalia deep black, widening from the vertex to the antennæ; facialia without bristles; epistoma not prominent. Eyes bare. Proboscis and palpi testaceous. Antennæ testaceous, not nearly extending to the epistoma; 3rd joint slender; arista black, plumose. Thorax with four black stripes, of which the outer pair are broader than the inner pair. Abdomen testaceous, semihyaline, with a black dorsal stripe, and with a black band on the hind border of each segment. Legs long, testaceous; tarsi black. Wings greyish; veins black; præbrachial vein forming a hardly obtuse angle at its flexure, from whence it is indistinctly undulating to its tip which joins the costal at a little in front of the tip of the wing; discal transverse vein slightly curved inward near its hind end, parted by hardly more than half its length from the border, and by hardly less than its length from the flexure of the præbrachial. Alulæ whitish. Length of the body 6 lines; of the wings 11 lines.

Mount Ophir.

Subfam. SARCOPHAGIDES.

Gen. SARCOPHAGA, *Meigen*.

73. *Sarcophaga ruficornis*, *Fabr. Syst. Antl.* 287. 12. (Musca.)

Malacca. Inhabits also Hindostan.

74. *SARCOPHAGA RECIPROCA*, n. s., fem. Cana, capite albo, frontalibus palpis antennis thoracis vittis pedibusque nigris, abdomine subtessellato, alis subcinereis.

Female. Hoary. Head white; frontalia black, linear. Proboscis, palpi and antennæ black. Thorax with three black stripes, and with black lines intersecting the two intermediate hoary stripes. Abdomen slightly tessellated. Legs black. Wings greyish; veins black; præbrachial forming a right angle at its flexure, near which it is much curved inward, and is thence straight to its tip; discal transverse vein slightly undulating, parted by less than its length from the border, and by little more than half its length from the flexure of the præbrachial. Alulæ white. Length of the body 6 lines; of the wings 11 lines.

Singapore. A smaller specimen from Malacca apparently belongs to this species.

75. *SARCOPHAGA ALIENA*, n. s., fem. Cana, capite albo, frontalibus palpis antennis thoracis vittis pedibusque nigris, abdomine tessellato, alis subcinereis.

Female. Hoary. Head white; frontalia black, slightly widening in front. Proboscis, palpi and antennæ black. Thorax with three black stripes, and with black lines intersecting the two intermediate hoary stripes. Abdomen tessellated. Legs black. Wings slightly greyish; veins black; præbrachial forming a very slightly acute angle at its flexure, near which it is much curved inward, and is thence straight to its tip; discal transverse vein

hardly undulating, parted by a little less than its length from the border, and by much more than half its length from the flexure of the præbrachial vein. Alulæ white. Length of the body 4 lines; of the wings 8 lines.

Mount Ophir.

Subfam. MUSCIDES.

Gen. IDIA, Meigen.

76. IDIA TENEBROSA, n. s., fœm. Obscurè viridis punctata, capite pedibus halteribusque nigris, antennis piceis, alis fusco-cinereis apud costam nigris.

Female. Dull green. Head slightly tuberculated above, black and shining in front. Frontalia dull black, hardly decreasing in breadth to the base of the antennæ which are piceous. Thorax very minutely punctured, with a slight hoary tinge which is interrupted by three slender indistinct black stripes. Abdomen shining, thickly punctured. Legs black. Wings brownish grey, black along the costa. Alulæ grey, with black borders. Halteres black. Length of the body $4\frac{1}{2}$ lines; of the wings 7 lines.

Mount Ophir. Inhabits also South Africa.

77. IDIA BICOLOR, n. s., fœm. Viridis, capite albido, facie nigrâ, frontalibus obscurè nigris, antennis fulvis, thorace nigro-quadrivittato, abdomine æneomarginato, vittâ dorsali nigrâ, pedibus nigris, alis cinereis costâ apiceque nigricantibus, halteribus albidis.

Female. Green. Head whitish and shining above, black and shining in front. Frontalia dull black, linear, furcate hindward. Antennæ tawny. Thorax with a slight hoary bloom and with four slender black stripes. Abdomen æneous at the tip and along each side, and with a slight black dorsal stripe. Legs black; coxæ and femora green. Wings grey, blackish along the costa and at the tips. Alulæ dingy whitish. Halteres whitish. Length of the body 3 lines; of the wings 5 lines.

Malacca.

Gen. MUSCA, Linn.

78. Musca flaviceps, Macq. *Dipt. Exot.* ii. 2. 145. 23. pl. 18. f. 1. (Lucilia.) (Genus Chrysomyia, Desv.)

Singapore. Inhabits also Hindostan.

79. MUSCA CHRYSOIDES, n. s. (genus Chrysomyia, Desv.), mas. Sericeo-viridis, capite testaceo, palpis antennisque fulvis, abdominis vittâ dorsali fasciisque nigris, alis subcinereis apice obscurioribus.

Male. Sericeous green, hardly shining. Head testaceous. Proboscis black. Palpi and antennæ tawny. Abdomen with a black dorsal stripe, and with a black band on the hind border of each segment. Legs black; coxæ and femora green. Wings greyish, much darker towards the tips; veins black, tawny along the costa; præbrachial vein forming a very obtuse and somewhat rounded angle at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein deeply undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial vein. Alulæ dingy testaceous. Length of the body 5 lines; of the wings 10 lines.

Malacca and Mount Ophir.

80. *MUSCA PORPHYRINA*, n. s. (genus *Lucilia*, *Desc.*), fœm. *Purpurea*, capite albido, antennis pedibusque nigris, palpis fulvis, abdomine æneo-purpureo, alis cinereis.

Female. Purple. Head whitish. Proboscis and antennæ black. Palpi tawny. Thorax with a slight hoary tinge which is very indistinctly striped. Abdomen bronze-purple. Legs black. Wings grey; veins black; præbrachial vein forming a very slightly obtuse angle at its flexure, from whence it is very slightly curved inward to its tip; discal transverse vein nearly straight, parted by little more than half its length from the border and from the flexure of the præbrachial. Alulæ dark grey. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

Mount Ophir, at the height of 4000 feet.

81. *MUSCA TRITA*, n. s. (genus *Lucilia*, *Desc.*), fœm. *Cyaneo-viridis*, capite pedibusque nigris, facie albâ, thoracis lateribus subpurpurascens, abdominis lateribus apiceque albido-tomentosis, alis sublimpidis.

Female. Bright bluish-green. Head and appendages and legs black; face white. Sides of the thorax slightly purplish. Abdomen green, with slight whitish tomentum along each side and at the tip. Wings almost limpid; veins black; præbrachial vein forming a very obtuse and slightly rounded angle at its flexure, from whence to its tip it is hardly curved inward; discal transverse vein hardly curved inward, parted by much less than its length from the border and by a little less than its length from the flexure of the præbrachial vein. Alulæ greyish. Length of the body 3 lines; of the wings 6 lines.

Malacca.

82. *MUSCA DEFIXA*, n. s. (genus *Lucilia*, *Desc.*), mas. *Cyaneo-viridis*, capite albido, epistomate testaceo, palpis pedibusque nigris, antennis fulvis, alis subcinereis.

Male. Bluish-green. Head whitish; epistoma testaceous. Proboscis, palpi and legs black. Antennæ tawny. Wings greyish; veins black; præbrachial vein forming a slightly obtuse and slightly rounded angle at its flexure, from whence to its tip it is moderately curved inward; discal transverse vein slightly undulating, parted by one-third of its length from the border, and by less than half its length from the flexure of the præbrachial. Alulæ grey. Length of the body 3 lines; of the wings 6 lines.

Singapore.

83. *MUSCA REFLECTENS*, n. s. (genus *Pollenia*, *Desc.*), fœm. *Purpureo-cyanea*, viridi-varia, capite fulvo, frontalibus cinereis, palpis antennisque testaceis, pectore testaceo, maculis duabus purpureo-cyaneis, abdomine cano-subtessellato, apice æneo, pedibus validis nigris, tibiis fulvis, alis subcinerascens.

Female. Purplish-blue tinged with green, hardly shining. Head fawn-colour, testaceous in front; frontalia cinereous. Proboscis black. Palpi, antennæ and pectus testaceous, the latter with a purplish-blue mark on each side. Abdomen slightly tessellated with hoary tomentum, æneous at the tip. Legs black, stout; tibiæ tawny. Wings very slightly greyish; veins black, testaceous towards the base and along the costa; præbrachial

vein forming a very obtuse angle at its flexure, from whence it is slightly undulating to its tip; discal transverse vein very deeply undulating, parted by full half its length from the border, and by much less than its length from the flexure of the præbrachial vein. Alulæ white. Length of the body 5 lines; of the wings 10 lines.

Malacca.

84. *MUSCA INFIXA*, n.s. (genus *Silbomyia*, *Macq.*), fœm. Viridi-cyanea, capite albido, frontalibus antennisque nigris, palpis fulvis, thoracis vittis quatuor abdomineque purpureis, pedibus piceis, femoribus cyanascentibus, alis cinereis costâ venisque fusco-marginatis.

Female. Greenish-blue. Head whitish. Frontalia, proboscis and antennæ black. Palpi tawny. Thorax with four purple stripes. Abdomen purple. Legs piceous; femora bluish. Wings grey, brownish along the costa and along the borders of the veins, which are black; præbrachial vein forming an almost right and somewhat rounded angle at its flexure, from whence it is very slightly curved inward to its tip; discal transverse vein very slightly undulating, parted by full half its length from the border, and by much more than its length from the flexure of the præbrachial vein. Alulæ dark grey. Length of the body 5 lines; of the wings 10 lines.

Singapore.

85. *MUSCA FUMIPENNIS*, n.s. (genus *Silbomyia*, *Macq.*), fœm. Cyaneo-viridis, capite testaceo, frontalibus piceis, palpis antennisque testaceis, thoracis vittis quatuor subobsoletis purpurascentibus, scutello abdomineque purpureo-cyaneis, pedibus nigris robustis densè pilosis, alis fuscis, apud costæ dimidium basale sublimpidis.

Female. Bluish-green. Head pale testaceous; frontalia piceous. Proboscis black. Palpi and antennæ testaceous. Thorax with four very indistinct purplish stripes. Scutellum and abdomen purplish-blue. Legs black, stout, thickly pilose; fore coxæ tawny. Wings brown, paler at the tips and along the hind border, nearly limpid along the costa for half the breadth, and rather less than half the length from the base; veins black; præbrachial vein forming a very slightly oblique and much-rounded angle at its flexure, from whence it is moderately curved inward to its tip; discal transverse vein nearly straight, parted by rather more than half its length from the border, and by much less than its length from the flexure of the præbrachial vein. Alulæ grey. Length of the body 5 lines; of the wings 10 lines.

Singapore.

86. *MUSCA DOTATA*, n.s. (genus *Phormia* ? *Desv.*), mas. Viridis, capite antico albo, palpis antennisque fulvis, abdominis vittâ dorsali nigrâ fascisque nigro-æneis, pedibus nigris, alis cinereis, dimidio apicali antico nigro-fusco.

Male. Green. Head white in front. Proboscis black. Palpi and antennæ tawny. Abdomen with a black dorsal stripe, and with blackish bronze bands. Legs black. Wings grey; apical half blackish-brown, excepting the hind border; veins black; præbrachial vein forming a very obtuse and somewhat rounded angle at its flexure, from whence it is very slightly

curved inward to its tip; discal transverse vein moderately undulating, parted by little more than half its length from the border and by rather less than its length from the flexure of the præbrachial. Alulæ grey. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Singapore.

87. *MUSCA DIFFIDENS*, n. s. (genus *Pyrellia*, *Descr.*), fœm. Cyaneo-viridis, capite albido, palpis antennis pedibusque nigris, alis vix cinerascensibus.

Female. Bright bluish-green. Head whitish. Proboscis, palpi, antennæ and legs black. Wings hardly greyish; veins black; præbrachial vein gently curved at its flexure, from whence it is almost straight to its tip; discal transverse vein almost straight, parted by much less than its length from the border, and by much more than its length from the curve of the præbrachial vein. Alulæ whitish. Length of the body 3 lines; of the wings 6 lines.

Singapore.

88. *MUSCA CONFIXA*, n. s. (genus *Pyrellia*, *Descr.*), fœm. Latè viridis cyaneo purpureoque varia, capite nigro, antice albido, palpis testaceis, antennis nigris basi rufescentibus, abdominis apice subæneo, pedibus nigris, alis cinereis.

Female. Bright green, tinged with blue and purple along each side. Head black above, whitish in front. Proboscis black. Palpi testaceous. Antennæ black; first and second joints reddish. Abdomen slightly æneous at the tip. Legs black; femora green. Wings grey; veins black; præbrachial vein gently curved at its flexure, between which and its tip it is slightly curved inward; discal transverse vein moderately undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial vein. Alulæ dark grey. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Mount Ophir, at the height of 4000 feet.

89. *MUSCA REFIXA*, n. s. (genus *Pyrellia*, *Descr.*), fœm. Purpurea, lateribus subtusque cyanea aut cyaneo-viridis, capite antico, palpis pedibusque nigris, antennarum articulo tertio piceo, alis subcinereis.

Female. Purple shining, blue on each side and beneath. Head in front, proboscis, palpi and legs black. Third joint of the antennæ piceous. Wings slightly greyish; veins black; præbrachial vein forming a gentle curve at its flexure, which is very near the border, indistinctly curved outward from thence to its tip; discal transverse vein almost straight, parted by little more than half its length from the border, and by about its length from the flexure of the præbrachial vein. Alulæ grey. Length of the body $2\frac{1}{2}$ – $2\frac{3}{4}$ lines; of the wings 5 – $5\frac{1}{2}$ lines.

Var. β. Bluish-green. Scutellum purplish-blue. Discal transverse vein very indistinctly curved inward.

Singapore.

90. *MUSCA PERFIXA*, n. s. (genus *Pyrellia*, *Descr.*), fœm. Purpurea, capite palpis antennis pedibusque nigris, alis limpidis.

Female. Very nearly allied to *M. refixa*. Purple, shining. Head and appendages and legs black. Wings limpid; veins black; præbrachial vein

forming a gentle curve at its flexure which is very near the border, straight from thence to its tip; discal transverse vein almost straight, parted by about half its length from the border, and by a little more than its length from the flexure of the præbrachial vein. Alulæ whitish. Length of the body 3 lines; of the wings 6 lines.

Mount Ophir.

91. *MUSCA AFFIXA*, n. s. (genus *Morellia*, *Desv.*), mas. Obscurè nigra, capite antico albo, thoracis vittis tribus latis albidis, abdomine subtessellato, alis subcinereis.

Male. Dull black. Head white in front. Thorax with three broad whitish stripes. Abdomen slightly tessellated. Wings greyish; veins black; præbrachial vein forming a gentle curve at its flexure which is very near the border, nearly straight from its flexure to its tip; discal transverse vein hardly undulating, parted by less than half its length from the border, and by little less than its length from the flexure of the præbrachial vein. Alulæ grey. Length of the body 4 lines; of the wings 7 lines.

Mount Ophir.

Subfam. ANTHOMYIDES, *Walk.*

Gen. *ARICIA*, *Macq.*

92. *ARICIA ARGENTATA*, n. s., mas. Cana, capite argenteo, palpis antennis pedibusque nigris, thoracis vittis duabus nigricantibus, scutelli apice testaceo, abdominis maculis quatuor nigris dorsalibus basi testaceo, femoribus testaceis, alis subcinereis.

Male. Hoary. Head silvery-white. Proboscis, palpi, antennæ and legs black. Thorax with two blackish stripes. Scutellum towards the tip and femora testaceous. Abdomen with four black dorsal spots, testaceous towards the base. Wings and alulæ slightly greyish; veins black, testaceous towards the base; cubital and præbrachial veins slightly diverging for about two-thirds of their length from the præbrachial transverse vein, very slightly converging from thence to the border; discal transverse vein oblique, slightly curved inward along its hind half, parted by a little more than its length from the præbrachial transverse, and by much less than its length from the border. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Malacca.

Gen. *HYDROTEA*, *Macq.*

93. *HYDROTEA SOLENNIS*, n. s., mas. Nigra, capite cano, thorace subcinereo nigro-trivittato, abdomine longi-obconico, tibiis ferrugineis, alis subcinereis.

Male. Black. Head hoary in front. Thorax slightly cinereous, with three black stripes. Abdomen elongate-obconical. Tibiæ ferruginous. Wings slightly greyish; veins black, testaceous at the base; cubital and præbrachial veins slightly diverging for nearly two-thirds of their length from the præbrachial transverse vein, very slightly converging from thence to the border; discal transverse vein oblique, curved inward in the middle, parted by about its length from the præbrachial transverse and by little more than

half its length from the border. Alulæ greyish. Length of the body $2\frac{5}{8}$ lines; of the wings 5 lines.

Mount Ophir, at the height of 4000 feet.

94. *ARICIA PATULA*, n. s., mas. Nigra sat lata, antennis, thoracis lateribus, abdomine pedibusque fulvis, abdominis apice tarsisque nigris, alis cinereis.

Male. Black, rather broad. Eyes bright red. Antennæ, sides of the thorax, scutellum, abdomen and legs tawny. Abdomen hardly longer than broad, black towards the tip. Tarsi black. Wings and alulæ grey; veins black, tawny towards the base; cubital and præbrachial veins diverging for more than two-thirds of their length from the præbrachial transverse, parallel from thence to their tips; discal transverse vein very oblique, curved inward near its hind end, parted by more than half its length from the border, and by very little more than its length from the præbrachial transverse vein. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Singapore.

Subfam. HELOMYZIDES, *Fallen*.

Gen. XARNUTA, n. g. (*Plate I. fig. 4.*)

Helomyza affinis; mas et fœm. Corpus sat latum. Antennarum articulus 3^{us} linearis; arista nuda. Femora antica subtile tenuiter spinosa. Alæ latiusculæ.

Allied to *Helomyza*. *Male and Female*. Body rather broad. Third joint of the antennæ linear, rounded at the tip; arista bare. Fore femora with slender spines. Wings somewhat broad; discal transverse vein slightly oblique, parted by much less than half its length from the border, and by about its length from the præbrachial transverse vein.

95. *XARNUTA LEUCOTELUS*, n. s., mas et fœm. Ferrugineo-fulva, antennis testaceis, pedibus fulvis, alis nigro-fuscis apice albis, margine postico subcinereo.—Fœm. Abdominis apice nigro.

Male and Female. Ferruginous tawny, with black bristles. Head rather paler. Antennæ testaceous; arista black. Legs tawny; fore femora with black spines beneath. Wings blackish-brown, greyish along the hind border for more than half the breadth and less than half the length from the base; extreme tips white; veins black. Alulæ whitish testaceous.

Female. Tip of the abdomen black. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Singapore.

Gen. HELOMYZA, *Fallen*.

96. *HELOMYZA INTEREUNS*, n. s., mas. Fulva, capite metathorace pectore pedibusque testaceis, abdominis maculis transversis nigricantibus, tarsis ferrugineis, alis subcinereis apices versus et apud venam transversam discalem fuscis.

Male. Tawny with black bristles. Head, metathorax, pectus, legs and halteres testaceous. Abdomen with a transverse blackish mark on the disk of each segment towards the tip. Tarsi somewhat ferruginous. Wings slightly greyish; tips brown, which hue is darkest in front; veins tawny,

black towards the tips; transverse veins black. Discal transverse vein clouded with brown, parted by much less than its length from the border, and by much more than twice its length from the præbrachial transverse vein. Alulæ whitish. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines. Malacca.

97. *HELOMYZA EXEUNS*, n. s., mas. Fulva, capite antico, metathorace pectore pedibusque testaceis, abdominis maculis transversis nigricantibus, tarsis ferrugineis apice fuscis, alis subcinereis maculâ apicibusque fuscis.

Very nearly allied to *H. intereuns*. *Male*. Tawny. Head in front, metathorax, pectus, legs and halteres testaceous. Abdomen with a transverse blackish mark on the disk of each segment. Tarsi ferruginous, with black tips. Wings slightly greyish; tips brown; veins black, tawny at the base; a brown spot on the discal transverse vein, which is straight, slightly oblique, parted by less than its length from the border, and by about thrice its length from the discal transverse vein. Alulæ whitish. Length of the body $2\frac{1}{4}$ lines; of the wings $4\frac{1}{2}$ lines.

Mount Ophir.

Subfam. LAUXANIDES, *Walk.*

Gen. LAUXANIA, *Latr.*

98. *LAUXANIA EUCERA*, n. s., mas. Nigra cinerco-tomentosa, capite atrobiguttato, antennis piceis longissimis, aristâ albâ, abdomine pedibusque fulvis, femoribus tibiisque nigro-fasciatis, alis subcinereis apud costam subluridis.

Male. Black, with greyish tomentum. Head with a deep black spot on each side between the eyes. Proboscis dull tawny. Palpi black. Antennæ piceous; 1st joint long; 3rd slender, cylindrical, longer than the 1st and the 2nd together; arista white, pubescent, longer than the 3rd joint. Abdomen and legs tawny; femora and tibiæ with black bands; tarsi with black tips. Wings greyish, slightly lurid along the costa; veins black; discal transverse vein straight, slightly oblique, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse vein. Halteres tawny. Length of the body 2 lines; of the wings $4\frac{1}{2}$ lines.

Singapore.

99. *LAUXANIA DETEREUNS*, n. s., fœm. Nigra, nitens, antennis piceis, aristâ nigrâ, tarsis anticis basi tibiisque tarsisque posterioribus testaceis, alis subcinereis.

Female. Black, shining, with black bristles. Antennæ piceous; 3rd joint elongate-conical, much shorter than that of *L. eucera*; arista black, pubescent, full thrice the length of the 3rd joint. Fore tarsi at the base and posterior tibiæ and tarsi testaceous. Wings slightly greyish; veins and halteres testaceous; discal transverse vein straight, almost upright, parted by almost its length from the border and by nearly twice its length from the præbrachial transverse vein. Length of the body $1\frac{1}{4}$ line; of the wings 3 lines.

Mount Ophir, at the height of 4000 feet.

Gen. CELYPHUS, *Dalman*.

100. *Celyphus obtectus*, *Dalman*, *Analecta Entomologica*, 32. 1. pl. 2. B. f. 1-5.

Malacca. Inhabits also Hindostan and the Philippine Islands.

Subfam. ORTALIDES, *Haliday*.Gen. LAMPROGASTER, *Macq.*

101. LAMPROGASTER ZONATA, n. s., fœm. Nigra, capite flavo nigro-vario, antennis piccis, thorace flavo-quadrivittato, abdomine flavo-bifasciato, tarsis albis, alis subcinereis maculis costalibus fasciâque fuscis.

Female. Black, shining. Head pale yellow, with four black shining stripes in front; vertex, with a broad dull black stripe which occupies the whole breadth behind, is notched on each side between the eyes, and is narrower in front. Antennæ piceous; 3rd joint nearly linear, rounded at the tip; arista minutely plumose, more than twice the length of the 3rd joint. Thorax with four yellow stripes, one on each side in front of the wings, and one on each side of the scutum. Abdomen with two yellow bands; 1st slender; 2nd apical, dilated in the middle of the fore border; knees tawny; tarsi white, with blackish tips. Wings greyish, slightly lurid and with brown marks at the base and along the costa, and with a brown band which extends along the præbrachial vein to half the space between the latter and the border; discal transverse vein straight, upright, parted by about one-third of its length from the border, and by much more than its length from the præbrachial transverse, which is oblique. Halteres tawny. Length of the body 5 lines; of the wings 10 lines.

Singapore.

102. LAMPROGASTER GLABRA, n. s., mas. Nigra, antennis piccis, abdominis fasciâ subapicali flavâ, tarsis albis, alis sublimpidis maculis basalibus fasciisque quatuor fuscis.

Male. Black, shining. Antennæ piceous, in structure like those of *L. zonata*. Abdomen with a slender yellow band near the tip. Tarsi white, with black tips. Wings nearly limpid, with four brown bands, slightly testaceous and with some indistinct brown marks at the base; 1st and 3rd bands entire; 1st broader and darker than the others; 2nd and 4th interrupted; veins black, testaceous towards the base; discal transverse vein straight, upright, parted by one-fourth of its length from the border, and by more than its length from the præbrachial transverse vein, which is also upright. Halteres tawny. Length of the body 3 lines; of the wings 6 lines.

Singapore.

103. LAMPROGASTER TRANSVERSA, n. s., fœm. Nigra, capite fulvo fasciis duabus nigris unâque albidâ, antennis fulvis, thoracis vittis quatuor dorsalibus fulvis duabusque lateralibus albidis, abdomine nigro-purpureo basi fulvo maculisque duabus subapicalibus flavis, pedibus fulvis, tarsis albidis, alis subcinereis fusco sexfasciatis.

Female. Black. Head tawny, with two black bands above and a whitish band in front. Antennæ tawny. Thorax with four dorsal tawny stripes which

are confluent in front and with two lateral whitish stripes. Abdomen blackish-purple, tawny at the base, and with a yellow spot on each side near the tip which is lanceolate. Legs tawny; tarsi whitish, with black tips; hind tibiæ with brownish tips. Wings slightly greyish, with about six irregular macular brown bands; veins brown, tawny at the base; discal transverse vein nearly straight and upright, parted by much less than its length from the border, and by more than its length from the præbrachial transverse vein, which is oblique. Halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

Malacca.

104. *LAMPROGASTER VITTATA*, n. s., mas. Nigra, capite ex parte flavo, antennis fulvis, thorace flavo-bivittato, scutello flavo-marginato, abdominis vittâ dorsali flavâ, tarsis albis, alis nigricantibus basi fasciisque quatuor albidis.

Male. Black, shining. Head pale yellow in front, beneath and about the eyes. Antennæ tawny. Thorax with two yellow stripes; scutellum with a yellow border. Pectus with an oblique yellow band on each side. Abdomen with a yellow dorsal stripe. Tarsi white, with black tips. Wings blackish, whitish at the base, and with four whitish bands; 1st band irregular; 2nd and 3rd entire; 4th interrupted; veins black; discal transverse vein straight, upright, parted by about one-fourth of its length from the border, and by much more than its length from the præbrachial transverse vein, which is slightly oblique. Halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Singapore.

105. *LAMPROGASTER GUTTATA*, n. s., fem. Cinerea, capite nigro trinaculato anticè testaceo, antennis fulvis, thorace cano-quinquevittato, lateribus testaceis, abdominis fasciâ anticâ fulvâ, tarsis albidis, alis subcinereis fasciis octo subinterruptis fuscis.

Female. Black, with cinereous tomentum. Head partly dull testaceous in front; vertex with three black spots, two in front and one behind. Antennæ tawny; arista pubescent. Thorax with five hoary stripes which are connected in front by a transverse band; sides testaceous. Pectus with an oblique dull testaceous stripe on each side. Abdomen with a tawny band on the hind border of the first segment; oviduct slender, lanceolate. Tarsi whitish, with black tips. Wings greyish, with about eight irregular and partly interrupted brown bands; veins and halteres testaceous; discal transverse vein nearly straight and upright, parted by about one-fourth of its length from the border, and by more than its length from the præbrachial transverse vein. Length of the body 3 lines; of the wings 6 lines.

Singapore.

106. *LAMPROGASTER TRUNCATULA*, n. s., fem. Nigra robusta, abdominis apice compresso lanceolato, tarsis albis, alis subcinereis lituris transversis fusciscentibus fasciisque duabus nigro-fuscis.

Female. Black, stout, slightly shining. Arista pubescent. Abdomen compressed and lanceolate at the tip. Tarsi white, with black tips. Wings slightly greyish, with several slight transverse brownish marks, and with

two blackish-brown bands; the 1st broad, basal, not extending beyond half the breadth from the costa; the 2nd narrow, entire, near the 1st; veins black; discal transverse vein straight and upright, parted by one-third of its length from the border, and by very much more than its length from the præbrachial transverse vein. Halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Singapore.

Gen. XANGELINA, n. g. (Plate I. fig. 3.)

Fem. Corpus latiusculum, parce setosum. Caput antice subdilatatum; facies magna. Antennæ breves; articulus 3^{us} longi-conicus; arista longa, gracilis, plumata. Abdomen brevi-ovatum, thorace non longius. Pedes breviusculi. Alæ mediocriter latæ; venæ rectæ.

Female. Body rather broad, with a few bristles. Head somewhat dilated in front; face large. Antennæ short; 3rd joint elongate-conical; arista long, slender, plumose. Abdomen short-oval, not longer than the thorax. Legs rather short. Wings moderately broad; subcostal vein extending to about one-fourth of the length of the wing; mediastinal extending a little beyond the subcostal; radial ending at about seven-eighths of the length; cubital ending at the tip; cubital and præbrachial almost parallel beyond the discal transverse vein, which is straight and upright, and parted by very much more than its length from the præbrachial transverse, and by much less than its length from the border.

107. XANGELINA BASIGUTTA, n. s., fem. Testacea, scutello fusco, abdomine fulvo, alis subcinereis guttâ costali nigrâ venis transversis nigro-sublimbatis.

Female. Testaceous. Proboscis partly brownish. Scutellum brown. Abdomen tawny. Wings slightly greyish; veins black; a black dot at the tip of the subcostal vein; transverse veins slightly clouded with black. Length of the body 2 lines; of the wings 4 lines.

Malacca.

Gen. PLATYSTOMA.

108. PLATYSTOMA RIGIDA, n. s., mas. Ferrugineo-fusca, capite subtus albo, antennis piceis, pectore albido, pedibus nigris, alis nigricantibus albo confertim at interruptè guttatis.

Male. Ferruginous-brown, tomentose. Head white behind and beneath, ferruginous and shining in front. Antennæ piceous; arista slightly plumose. Pectus whitish. Legs black. Wings blackish, thickly studded with white dots, which disappear at the base and on an undulating band beyond the middle; veins black. Length of the body 3 lines; of the wings 6 lines. Singapore.

109. PLATYSTOMA STELLATA, n. s., mas. Cinereo-nigra, capite subtus albido, antennis fulvis, facie abdominis apice pedibusque nigris nitentibus, alis obscurè cinereis guttis confertis at interruptis limpidis.

Male. Cinereous-black, tomentose. Head shining black in front, whitish behind and beneath. Antennæ tawny. Abdomen shining black at the

tip. Legs black and shining. Wings dark grey, with numerous limpid dots which are comparatively wanting on a blackish-brown stripe along two-thirds of the length of the costa, and on an exterior upright band which is connected with the above stripe. Length of the body 3 lines; of the wings 6 lines.

Malacca.

Gen. *THEMARA*, n. g. (Plate I. fig. 5.)

Mas. *Corpus* latiusculum, subsetosum. *Caput* thorace paullo angustius. *Antennæ* epistoma non attingentes; articulus 3^{us} lanceolatus, longiusculus; arista latè plumosa. *Abdomen* ellipticum, thorace non longius. *Alæ* latiusculæ, obscuræ, maculis pallidis, venis radiali et cubitali undulatis.

Male. Body rather broad. Head and thorax slightly setose. Head a little less broad than the thorax; epistoma not prominent. Proboscis short. Palpi short, porrect. *Antennæ* not reaching the epistoma; 3rd joint lanceolate, rather long; arista deeply plumose, about twice the length of the 3rd joint. Abdomen elliptical, as long as the thorax. Wings rather broad, dark, with pale marks; subcostal vein ending at much beyond one-third of the length; mediastinal ending at much beyond half the length; radial undulating, ending at about five-sixths of the length; cubital undulating, ending at the tip of the wing; præbrachial and subanal hardly undulating; discal transverse vein straight, nearly upright, parted by one-tenth of its length from the border, and by more than half its length from the præbrachial transverse.

110. *THEMARA AMPLA*, n. s., mas. Ferruginea, subtùs testacea, scutello, abdominis fuscì fasciis tribus pedibusque testaceis, alis obscurè fuscis, maculis tribus anticis luridis tribusque posticis albis.

Male. Ferruginous, slightly shining, testaceous beneath. Head in front and appendages testaceous. Scutellum and legs testaceous. Abdomen brown above, testaceous at the base and with two testaceous bands. Wings dark brown, with three hyaline triangular spots in front and three on the hind border; the costal spots lurid, the hind spots white. Length of the body 4 lines; of the wings 8 lines.

Singapore.

Gen. *STRUMETA*, n. g. (Plate II. fig. 4.)

Fœm. *Corpus* latiusculum, pubescens, vix setosum. *Abdomen* brevi-ovatum, thorace latius et paullo longius. *Alæ* mediocriter latæ, limpidæ, fasciis fuscis, venâ transversâ præbrachiali undulatâ, perobliquâ.

Female. Body rather broad, dull, pubescent, hardly setose. Head rather less broad than the thorax; epistoma not prominent. Proboscis and palpi short. *Antennæ* mutilated in the insect here described. Abdomen short oval, broader and a little longer than the thorax. Wings moderately broad, limpid with brown bands; longitudinal veins almost straight; subcostal and mediastinal veins almost contiguous; mediastinal vein ending at much beyond half the length of the wing; radial ending at a little beyond four-fifths of the length; cubital ending at somewhat in front of the tip; discal

transverse vein nearly straight and upright, parted by full one-fourth of its length from the border, and by about its length from the præbrachial transverse which is undulating and very oblique.

111. *STRUMETA CONFORMIS*, n. s., fœm. Cervina, thoracis vittis duabus, metathorace et pectoris disco nigricantibus, pedibus testaceis, alis limpidis fusco-quadrifasciatis.

Female. Fawn-colour. Thorax with two blackish stripes. Metathorax and disk of the pectus blackish. Legs and halteres testaceous. Wings limpid, pale brown along the costa, and with four pale brown bands; 1st and 2nd bands connected hindward; veins black, testaceous towards the base. Length of the body 4 lines; of the wings 7 lines.

Singapore.

Gen. *VALONIA*, n. g. (Plate I. fig. 6.)

Fœm. *Corpus* sat angustum, pubescens. *Caput* anticè subdilatatum. *Antennæ* breviusculæ; articulus 3^{us} longi-conicus; arista pubescens. *Abdomen* fusiforme, thorace paullo longius. *Pedes* sat robusti. *Alæ* angustæ, obscuræ, maculis limpidis.

Allied to *Platystoma*.—*Female.* Body rather narrow, dull, pubescent. Head as broad as the thorax, slightly dilated in front; epistoma not prominent. Proboscis and palpi short. *Antennæ* rather short, not reaching the epistoma; 3rd joint elongate-conical; arista pubescent. Abdomen fusiform, a little longer than the thorax. Legs rather stout, especially the hind pair. Wings narrow, dark with limpid spots; subcostal vein ending at before one-third of the length of the wing; mediastinal ending at much beyond half the length; radial ending at a little before three-quarters of the length; cubital and subanal hardly undulating, the former ending at a little in front of the tip of the wing; discal transverse vein straight and upright, parted by less than half its length from the border, and by a little less than its length from the præbrachial transverse.

112. *VALONIA COMPLICATA*, n. s., fœm. Obscurè cinerea, capite testaceo, thorace nigro-punctato, abdomine guttis quatuor lateralibus albis tomentosis subtus testaceo, pedibus fulvis, femoribus posterioribus tibiisque posticis nigris, alis subcinereis guttis plurimis limpidis.

Female. Dark grey. Head and appendages testaceous. Thorax punctured with black; humeral calli black, shining. Abdomen with two white tomentous dots on each side; underside testaceous. Legs tawny; posterior femora black, with tawny tips; hind tibiæ blackish except at the base. Wings greyish, with very numerous limpid dots, blackish and without dots along more than half the length of the costa; veins black. Halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

Malacca.

Gen. *SOPHIRA*, n. g. (Plate II. fig. 1.)

Fœm. *Corpus* sat angustum, pubescens. *Caput* thorace paullo angustius. *Antennarum* articulus 3^{us} longiusculus, sublanceolatus; arista plumosa.

Abdomen subfusiforme, apice attenuatum, thorace paullo longius. *Pedes* graciles. *Alæ* longiusculæ, sat angustæ, venis limbatis.

Female. Body rather narrow, dull, pubescent. Head a little less broad than the thorax; epistoma not prominent. Proboscis and palpi short. Antennæ not reaching the epistoma; 3rd joint rather long, sub lanceolate; arista plumose. Abdomen subfusiform, somewhat attenuated at the tip, a little longer than the thorax. Legs slender. Wings rather long and narrow; subcostal vein ending at before one-third of the length of the wing; mediastinal ending at much beyond half the length; radial ending at about seven-eighths of the length; cubital ending at very little in front of the tip; discal transverse vein straight, hardly oblique, parted by one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse.

This genus seems to be somewhat allied to the *Helomyzides*.

113. *SOPHIRA VENUSTA*, n. s., fœm. Testacea, thoracis fasciâ metathorace abdominisque fasciis tribus maculisque duabus subapicalibus nigris, tibiis fuscescentibus, alis limpidis venis fusco-limbatis.

Female. Testaceous. Thorax with a black band between the wings. Metathorax black. Abdomen with three black bands, and with a black subapical spot on each side. Tibiæ brownish; tarsi tawny. Wings limpid, lurid in front, striped with brown along most of the veins; veins black, tawny towards the base; cubital vein minutely setose towards the base. Length of the body 4 lines; of the wings 8 lines.

Singapore.

Gen. RIOXA, n. g. (Plate II. fig. 3.)

Fœm. *Corpus* angustum, pubescens. *Caput* sat parvum, thorace multo angustius. *Antennarum* articulus 3^{us} sublinearis; arista raro plumosa. *Thorax* longi-ovatus. *Abdomen* fusiforme, thorace multo angustius, vix longius. *Pedes* graciles, antici breves. *Alæ* longæ, mediocriter latæ, obscuræ, guttis albis.

Female. Body narrow, dull, pubescent. Head rather small, much less broad than the thorax; epistoma not prominent. Proboscis and palpi short. Antennæ not reaching the epistoma; 3rd joint almost linear, moderately long; arista thinly plumose. Thorax elongate-oval. Abdomen fusiform, much narrower, but hardly longer than the thorax. Legs slender; fore legs short. Wings long, moderately broad, dark with white dots; radial vein ending at rather in front of the tip of the wing; discal transverse vein almost straight, very oblique, parted by about one-fourth of its length from the border, and by somewhat less than its length from the præbrachial transverse.

114. *RIOXA LANCEOLATA*, n. s., fœm. Cervina, thorace nigro-quadrivittato, abdomine nigro vittâ dorsali cervinâ, pedibus testaceis, alis nigricantibus strigâ discali guttisque quinque albis.

Female. Fawn-colour. Proboscis, legs and halteres testaceous. Thorax with two blackish stripes on each side, the outer pair shortened hindward. Abdomen black, with a fawn-coloured dorsal stripe which is attenuated hindward, and does not extend to the tip. Wings blackish, almost limpid along the hind border for more than half the length from the base, with a white discal streak and with five white dots; 1st dot in a line with the streak; 2nd very minute,

behind the 1st; 3rd on the costa near the tip; 4th larger, apical, near the 5th, which is on the hind border. Length of the body 5 lines; of the wings 10 lines.

Singapore.

Gen. *XIRIA*, n. g. (*Plate II. fig. 2.*)

Mas. *Corpus* metallicolor, subsetosum. *Caput* latiusculum. *Palpi* longiuseuli. *Antennæ* breves; articulus 3^{us} sublinearis; arista latè plumosa. *Thorax* robustus. *Abdomen* lineare, thorace paulò longius et multò angustius. *Pedes* longiuseuli, sat validi. *Alæ* mediocriter longæ latæque.

Male. Body metallic, slightly setose. Head rather broad, hardly narrower than the thorax; epistoma not prominent. Proboscis short. Palpi porrect, rather long and stout. Antennæ short, not nearly reaching the epistoma; 3rd joint almost linear; arista deeply plumose, much more than twice the length of the 3rd joint. Thorax stout. Abdomen linear, a little longer than the thorax and about half its breadth. Legs rather long and stout. Wings moderately long and broad; subcostal vein ending at rather beyond one-third of the length; mediastinal ending at very much beyond half the length; radial ending at beyond five-sixths of the length; cubital ending at hardly in front of the tip; discal transverse nearly straight, slightly oblique, parted by about half its length from the border, and by rather more than its length from the præ-brachial transverse.

115. *XIRIA ANTICA*, n. s., mas. Purpurea, capite nigro, antennarum articulo 3^o ferrugineo, pedibus testaceis, tibiis nigris, tarsis albis anticis ferrugineis, alis sublimpidis apice nigricantibus maculis costalibus albis et nigricantibus.

Male. Purple. Head and appendages black. Third joint of the antennæ ferruginous. Legs testaceous; tibiæ black; fore tarsi ferruginous; posterior tarsi white, with brown tips. Wings nearly limpid, with two white and two blackish spots on the costa; tips blackish; veins black, testaceous along the costa. Halteres whitish. Length of the body 4 lines; of the wings 8 lines.

Mount Ophir.

Subfam. *ACHIIDES*, *Walk.*

Gen. *ACHIAS*, *Fabr.*

116. *Achias maculipennis*, *Westw. Oriental Entomology*, 38. pl. 18. f. 4. Singapore. Inhabits also Java.

Subfam. *DIOPSIDES*, *Walk.*

Gen. *DIOPSIS*.

117. *DIOPSIS QUINQUEGUTTATA*, n. s., fœm. Nigra, proboscide pedibusque fulvis, his ex parte fusciscentibus, alis nigricantibus basi apice guttisque quinque sublimpidis. (*Plate II. fig. 7.*)

Female. Black, shining. Proboscis tawny. Petioles of the eyes about half the length of the thorax. Scutellum with two spines, which are more than half the length of the thorax. Legs tawny, partly shaded with brown. Wings blackish, nearly limpid at the base and at the tips, and with two interrupted nearly

limpid bands, the first of two dots, the second of three dots; veins black. Length of the body 3 lines; of the wings $4\frac{1}{2}$ lines.

Mount Ophir.

118. *DIOPSIS QUADRIGUTTATA*, n. s., mas. Picea, capite oculorum petiolis pedibusque fulvis, his ex parte fuscescentibus, alis nigricantibus basi fasciâ subapicali guttisque quatuor sublimpidis. (*Plate II. fig. 6.*)

Male. Piceous, shining. Head and petioles of the eyes tawny, the latter fully half the length of the thorax. Scutellum with two spines, which are less than half the length of the thorax. Legs tawny, slightly shaded with brown. Wings blackish, nearly limpid at the base and towards the tips, except the extreme part of the latter which is slightly blackish; two interrupted nearly limpid bands, each composed of two dots; veins black. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Malacca.

Subfam. SEPSIDES, *Walk.*

Gen. CALOBATA, *Fabr.*

119. *CALOBATA CONFINIS*, n. s., fœm. Nigra, capite cyaneo, antennis piceis, femoribus posterioribus albo-cinctis, tarsis anticis albis, alis subcinereis fasciis duabus connexis fuscis, 2^a apicali.

Female. Black, dull. Head blue, shining. Proboscis and antennæ piceous. Posterior femora with a white ring near the tips; hind femora with a white ring at the base; fore tarsi white. Wings greyish, with two brown bands, the first connected on the hind border with the second, which is apical; veins black. Halteres whitish, with black knobs. Length of the body 7 lines; of the wings 10 lines.

Singapore and Mount Ophir.

120. *CALOBATA IMMIXTA*, n. s., fœm. Nigra, capite cyanescente, facialibus atris, antennis piceis, pedibus testaceis anticis nigris, tarsis anticis albis, femoribus posterioribus fasciis quatuor nigris, alis subcinereis fasciis duabus subconnexis fuscescentibus, 2^a apicali.

Female. Black, dull. Head bluish, shining; facialia deep black. Proboscis and antennæ piceous. Legs testaceous; fore femora black, testaceous towards the base; fore tibiæ black; fore tarsi white; posterior femora with four black bands; posterior tibiæ dull testaceous, black towards the base; posterior tarsi brownish. Wings slightly greyish, with two brownish bands, the first slightly connected on the hind border with the second which is apical; veins black. Length of the body 5 lines; of the wings 10 lines.

Malacca.

Subfam. PSILIDES, *Walk.*

Gen. MICROPEZA, *Macq.*

121. *MICROPEZA FRAGILIS*, n. s. Fulva, femoribus tibiisque anticis fuscis, tibiis posterioribus basi apiceque fuscis, tarsis anticis posticisque albidis, alis subcinereis guttis tribus apiceque limpidis.

Tawny. Fore femora and fore tibiæ brown; posterior tibiæ brownish at the

base and at the tips; fore tarsi and hind tarsi whitish. Wings very slightly greyish, with three limpid spots forming a curved band near the tips which are also limpid; veins black. Length of the body $3\frac{1}{2}$ –4 lines; of the wings 5–6 lines.

Singapore and Mount Ophir.

Gen. NERIUS, *Wied.*

122. *Nerius fuscipennis*, *Macq. Dipt. Exot.* ii. 3. 241. 1. pl. 325. f. 5.

Singapore and Mount Ophir. Inhabits also Java and the Philippine Islands.

Gen. TEXARA, n. g. (*Plate II. fig. 5.*)

Fœm. *Corpus* gracile, non setosum. *Caput* subproductum; facies brevis. *Antennæ* epistoma attingentes; articulus 3^{us} clavatus; arista pubescens, subapicalis. *Thorax* subfusiformis. *Abdomen* lanceolatum, thorace angustius et duplò longius. *Pedes* postici longi, femoribus incrassatis serratis, tarsis anticis subdilatatis. *Alæ* angustæ.

Female. Body slender, without bristles. Head slightly produced, as broad as the thorax; face short; epistoma not prominent. *Antennæ* extending to the epistoma; third joint clavate; arista minutely pubescent, seated near the tip of the third joint. *Thorax* subfusiform. *Abdomen* lanceolate, narrower than the thorax and about twice its length. Anterior legs moderately long and stout; fore tarsi slightly dilated; hind legs long; hind femora incrassated, serrated beneath; hind tibiæ slightly curved. Wings narrow; subcostal vein not extending to one-third of the length of the wing; mediastinal vein not extending to half the length; radial extending to a little beyond three-quarters of the length; cubital ending at very little in front of the tip of the wing; discal transverse vein straight, upright, parted by less than its length from the border, and by about thrice its length from the præbrachial transverse.

123. *TEXARA COMPRESSA*, n. s., fœm. Nigra, capite nigro-cyaneo subtùs cano, antennis piecis, aristâ albidâ, alis subcinereis, halteribus albidis.

Female. Black. Head bluish-black, with hoary tomentum beneath. *Antennæ* pieceous; arista whitish. Wings greyish; veins black. Halteres whitish. Length of the body 5 lines; of the wings 6 lines.

Singapore.

DESCRIPTION OF PLATES I. AND II.

Obs. All the figures are more or less magnified, and the outline-details comprise the side and front views of the head, antennæ, and base of the wings.

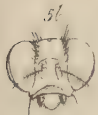
PLATE I.

Fig. 1. *Massicyta bicolor*; 1*a*, head seen sideways; 1*b*, the head seen in front; 1*c*, antenna.

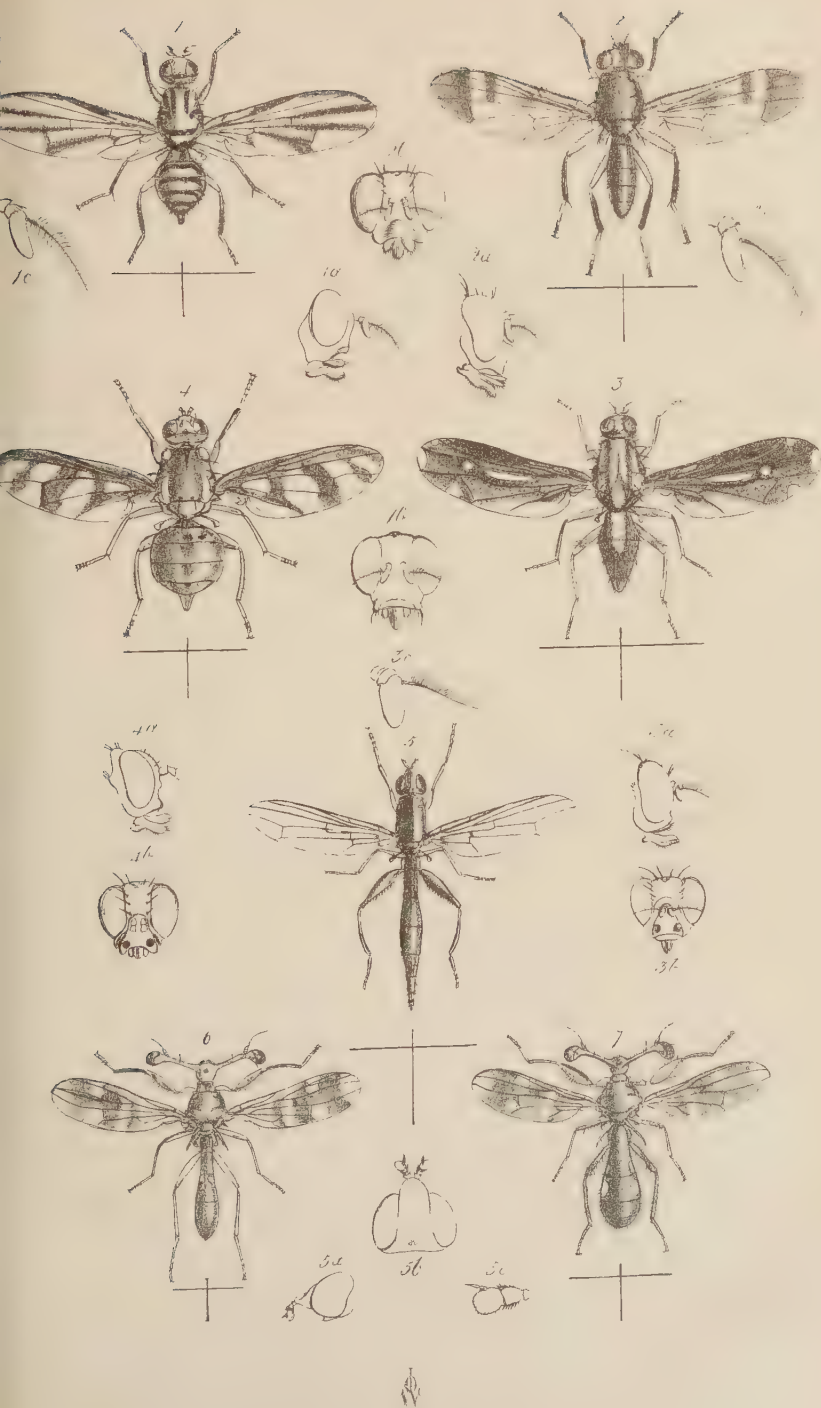
Fig. 2. *Zambesa Ocypteroïdes*; 2*a*, head sideways; 2*b*, ditto in front; 2*c*, antenna.

Fig. 3. *Xangelina basigutta*; 3*a*, head sideways; 3*b*, ditto in front; 3*c*, antenna; 3*d*, base of the wing.

Fig. 4. *Xarnuta leucotelus*; 4*a*, head sideways; 4*b*, ditto in front; 4*c*, antenna; 4*d*, base of wing.







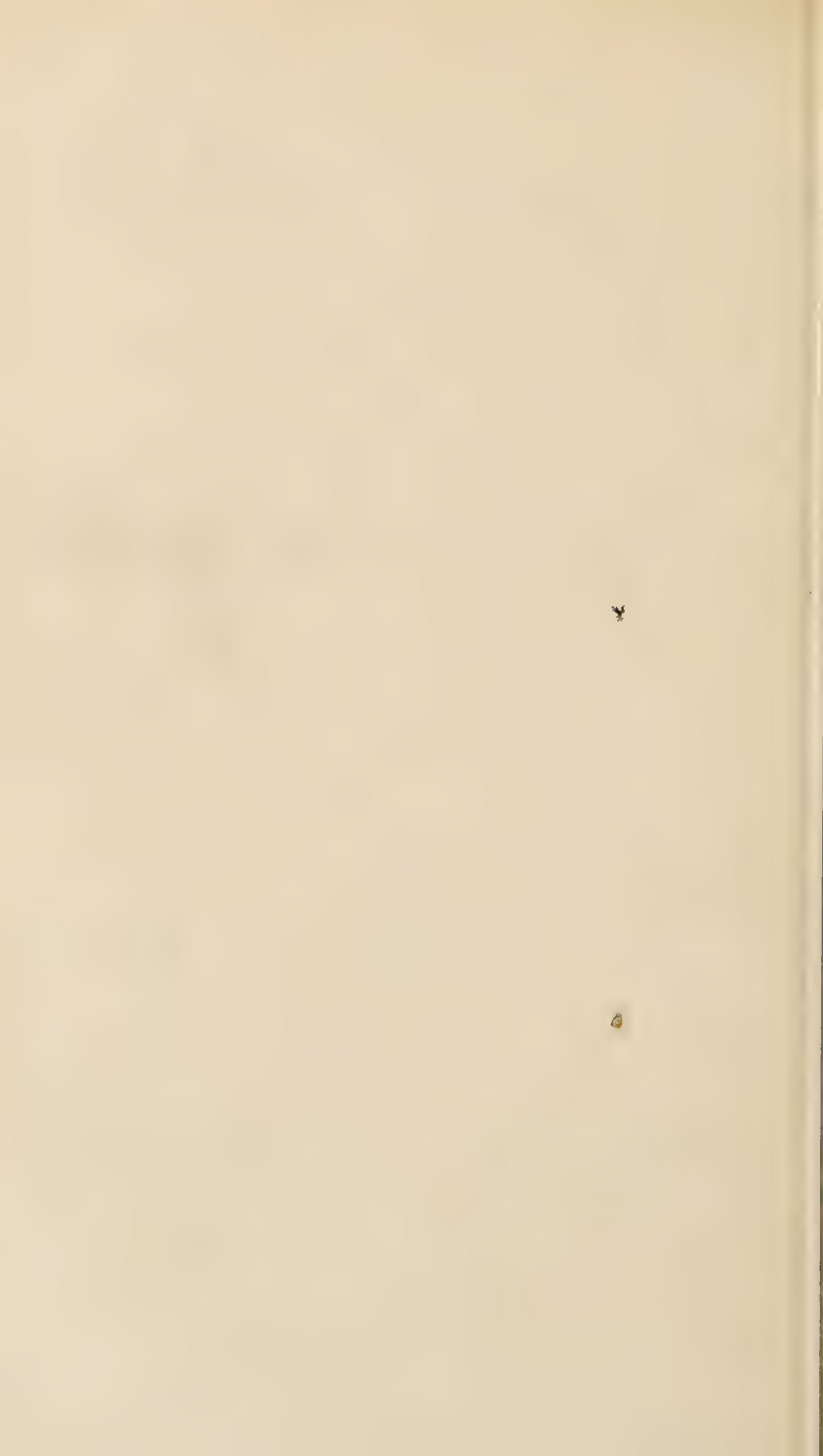


Fig. 5. *Themara ampla*; 5*a*, head sideways; 5*b*, ditto in front; 5*c*, antenna; 5*d*, base of wing.

Fig. 6. *Valonia complicata*; 6*a*, head sideways; 6*b*, ditto in front; 6*c*, antenna.

PLATE II.

Fig. 1. *Sophira venusta*; 1*a*, head sideways; 1*b*, ditto in front; 1*c*, antenna.

Fig. 2. *Xiria antica*; 2*a*, head sideways; 2*b*, ditto in front; 2*c*, antenna.

Fig. 3. *Rioxa lanceolata*; 3*a*, head sideways; 3*b*, ditto in front; 3*c*, antenna.

Fig. 4. *Strumeta conformis*; 4*a*, head sideways; 4*b*, ditto in front.

Fig. 5. *Texara compressa*; 5*a*, head sideways; 5*b*, ditto in front; 5*c*, antenna.

Fig. 6. *Diopsis 4-guttata*.

Fig. 7. *Diopsis 5-guttata*.

Note on a supposed species of *Pelopæus*. By EDWARD NEWMAN, Esq., F.L.S.

[Read January 15th, 1856.]

IN No. 59 of the "Proceedings" of our Society is a letter addressed to our Secretary on the economy of a certain Hymenopterous insect as observed by the writer when at Bombay: several of the explanations in this letter require correction, although evidently written in good faith. The description of the insect and its nest is fully sufficient to identify the tribe and even genus: it is one of the *Vespina*, and doubtless of the genus *Pelopæus*: the name of "Mason-bee" is therefore assigned to it in error, because there is a tribe of Mason-bees possessing a most wonderful and interesting economy, and with that tribe the present insect has nothing whatever to do.

In the second place, the male is represented as the builder of the nest,—a statement so opposed to all we know of the economy of *Hymenoptera*, that it may safely be pronounced erroneous; the building insect was certainly not a male, and as certainly a female or neuter.

In the third place, the shining green insect, described as the female, was unquestionably a parasite, probably of the genus *Chrysis*: its presence in the nest of the wasp was as an insidious enemy, not as the legitimate partner and participator in domestic care.

On the Natural History of the Glowworm (*Lampyrus noctiluca*).
By the late GEORGE NEWPORT, Esq., F.L.S. Prepared from
the Author's MS.* by GEORGE VINER ELLIS, Esq., Professor
of Anatomy in Univ. Coll., London. Communicated by the
Secretary †.

[Read December 18th, 1855.]

IN the summer of the years 1840, 1841 and 1842, I devoted a great deal of time to the investigation of the natural history and anatomy of the Glowworm, in continuation of some researches commenced in the country so long ago as the year 1830. These researches had reference more especially to the internal structure of the light-producing organs, and to the origin and nature of the light. But although the structure of the parts concerned was repeatedly and carefully examined, and although the insects themselves were submitted to numerous experiments, I was unable to arrive at any entirely satisfactory conclusion, either with regard to the peculiarities of the structure of the organs, or to the nature of the light which they emit. I felt bound, therefore, to withhold from publication the observations I had then made until such time as I might be able either to enter more fully into the examination both of the natural history of the insect and of its peculiar organization, or to afford such an explanation of the mode of origin and of the nature of its luminous property as would be in accordance with the many facts already ascertained by other inquirers. Some years later, on comparing the results of a series of observations on the habits and anatomy of other insects, and especially of *Meloë*, with the discoveries of Faraday and Matteucci in physical science, I was led to the conclusion that a very close relation exists between the *vital* and *instinctive forces* of the organic world and the physical forces of the inorganic. This view, which was announced in a

* Some additional MS. on the Anatomy and Light of the Glowworm, that is less complete, I hope to be able to communicate to the Society on a future occasion.—G. V. E.

† The materials of the present paper have been extracted from the note-books of the late Mr. Newport by Professor Ellis, of University College. It was evidently Mr. Newport's intention to have continued his observations on this very interesting insect; and there can be no doubt that, had he lived to carry out this intention, the paper would have appeared in a much more complete and elaborate form. But the observations, incomplete as they are, have appeared too important to be left unpublished; and, with this explanation, which is due to Mr. Newport's memory, they are now printed in the Society's "Journal of Proceedings."—SECRETARY.

paper on *Meloë* read to the Linnean Society on the 18th of November 1845, seems to me now to afford a correct explanation of the origin and nature of the light of the Glowworm, and to elucidate facts in the natural history of this and other insects, which do not seem to be reconcilable in any other way. Added to this, I am at length enabled, through more perfect means of microscopic investigation, to supply, from recent examination, facts respecting the anatomy of the light-giving organs and the other structures, which had escaped me in my former inquiries.

I propose, therefore, in this paper to give a full account of the natural history and anatomy of the Glowworm.

NATURAL HISTORY OF THE INSECT.

The Imago.

The Glowworm is an insect which has attracted the attention of our earliest naturalists: it was well known both in this country and on the continent. Although very limited in its geographical distribution, it is usually common in those parts in which it is located.

The period at which the *Lampyrus noctiluca* common to the north of Europe usually makes its first appearance in this country is about the middle of June, after it has undergone its metamorphosis. From that time to the end of June or the middle of July it is found in abundance on grassy banks, in sheltered spots in lanes, and at the sides of hedges, especially on calm dewy evenings. It is most abundant in Kent at the end of June, but in Gloucestershire in the middle of July, and shines most vividly at those times on perfectly calm evenings. Very few are observed to shine on cold rainy nights, and scarcely one is seen to glimmer on a perfectly dry night when there is a brisk cold wind. At a temperature of the air below 58° Fahr., the perfect female is said not to shine, but with that statement my own observations do not entirely agree. It has been thought, also, that the glowworm ceases to be luminous before midnight; but, although the light is given out most intensely and by the greater number of individuals before that hour, yet this is not invariably the case with all, as I have witnessed light emitted by some as late as two o'clock in the morning, and by others until after dawn. The light given out during the first few evenings of the glowworm's appearance is of a faint yellow colour, but after several evenings, if the creature continues to shine, it becomes of a greenish-yellow, and is less intense: this faintness is very marked if the insect has been kept

several days in confinement, and especially when there has not been communion with the other sex. It is given out from the ventral surface of the last three segments of the body, which are almost transparent, and have no dark pigment in their texture; but it is most intense in the anterior half of the tenth and eleventh segments, on each of which it forms two broad bands extending across the whole surface. In the twelfth or last segment it is feeble, and appears merely as two bright spots, one on each side of the surface, and each about the size of a moderate pin's head. The light is most intense in those females which have passed through their metamorphosis only within the last two or three days, and have not yet paired: in these it is sometimes so powerful, that I have been able to read small print for an hour by my watch in the darkest night. It is given forth most intensely in faint flashes immediately the insect becomes stationary after locomotion, and usually when it has crept up a blade of grass, or crawled along a slight eminence in its native haunts; if the insect is watched at that time, it may frequently be observed to coil the extremity of its body upwards, exposing its light most to view, and turning it to the right and to the left, as if to use it as a beacon for the wandering volant male. Even when she is perfectly stationary on the ground for a few minutes, the female rests with the extremity of her body turned to one side, so as still to show the light; though if the male continues absent, she seldom remains long in one place or position, but continues alternately to wander on and to rest, scintillating her light more and more intensely at intervals.

I have witnessed these circumstances repeatedly both in the natural haunts of the insect and in confinement; and am scarcely prepared to regard them as a direct act of the will, but rather as an evolution of instinct through the direct stimulus of vital causes, precisely as I regard what is in like manner believed to be a voluntary extinction of the light (Kirby and Spence, vol. ii.) at the moment of capture or of sudden contact with a foreign body. At the instant of such contact the entire body of the insect is contracted and shortened, more especially on the ventral surface; and not only are the light-giving segments drawn one within the other, but the luminous organs within them are simply removed from immediate contact with the tegument, and are not, as supposed by Murray* and Müller, hidden behind opaque parts: possibly the

* See Murray's Experimental Researches on the Light of the Glowworm. Edinb. 1826.

darkness may be also due to the withdrawal of nervous influence and its employment in the action of the muscles; and thus the semblance of an act of volition may be given to what is owing to purely vital and physical causes. This explanation appears probable from the fact that the light is never completely extinguished in the anal segment, in which the organs within are not easily removed from contact with the tegument by the ventral muscles. It may be necessary to bear these circumstances in mind, as we shall find that they are of some consequence with reference to the right interpretation of the nature of the light.

It has been supposed by most naturalists (Kirby and Spence, &c.*) that the production and use of the light have immediate reference to the function of reproduction,—a view in which I entirely coincide, as it is not only in accordance with the facts now stated, but with all the circumstances of the natural history of the insect. It has been objected to this view by some, that the male also is slightly luminous, but this fact in no way affects the conclusion with regard to the female.

The male of *Lampyrus noctiluca*, as every naturalist is aware, is a winged insect with large organs of vision over the greater portion of each side of the head. It is far less numerous than the female, and is very rarely taken, except on calm evenings, while hovering about, or when in company with the females shining most vividly; it is, however, allured by the presence of artificial light (Westwood, Introduction, p. 248). The sole object of its life in the winged state is to search out its partner; and as it takes no food whatever when it has assumed the winged condition, its period of existence is necessarily very brief, for it dies generally after it has paired. The light of the female too, after the union of the sexes, becomes greatly diminished, and soon after the deposition of her ova—a proceeding which occupies a few days—she also perishes; so that in a week or two after the middle of July, when almost every individual has deposited her ova or has died unimpregnated, all traces of the light of the glowworm are extinguished.

Like the females of most insects, the glowworm has her life prolonged for a considerable period beyond that of her congeners, if she has not been impregnated. And the chances that some of the females may not be impregnated are very great, as the males are not only few in number, but their time of appearance, so far as my

* Journal of a Naturalist, 1830, 3rd edit. p. 302; Westwood's Introduction, 1838, vol. i. p. 248.

observations have gone, is very limited; they are to be found chiefly only on the first two or three evenings after the glowworms have begun to shine, and just completed their metamorphoses, and even then only on warm calm nights. While, therefore, those females which have received the male proceed with the deposition of their ova, their light waning more and more on each evening until at length it ceases with the life of the parent, the unimpregnated females continue to shine more and more vividly on each succeeding night, and their life is prolonged for many days beyond the usual period in expectation of the chance partner that may yet remain. The period during which the glowworm continues to shine is rarely more than from fifteen to twenty days. Its time of appearance and disappearance varies only a few days in different localities, usually from the end of June to the middle of July; but if in the season of their coming forth the weather is boisterous and wet, not only are fewer individuals seen, but their time of stay is more limited, because many perish early, either at the time when their metamorphosis is about to be completed, and when excess of moisture is exceedingly injurious to them, or during their exposure on the herbage awaiting their partners. Instead of finding them abundant at one spot in such seasons, they are met with but rarely, and are scattered solitarily over a wide extent.

The Impregnation of the Female, and the Deposition of the Eggs.

In the summers of 1840 and 1841 I received from the country, through the kindness of a friend, several collections of glowworms, both in the latter stage of the larva, and in the imago state. With these I was enabled to watch the transformation, to observe the pairing of the sexes, and the development of the ova. Degeer originally watched the metamorphosis, and Martle, with subsequent writers, has given some account of the habits of the larva; but they left very much to be ascertained. In the middle of June 1841, having then received a collection of both male and female glowworms, and having also by me some other females, reared from larvæ sent to me in the early part of the year, which had not paired, I had the means of watching the whole of their natural history, and the period of the development of the young.

I placed a virgin female, which I knew to be such from having raised it from the pupa only a few hours before, under a glass, and put with it two of the males which I had then just received from the country. This was at six in the evening of the 19th of June.

Within a very few seconds of the occurrence, the males became most assiduous in their attention to the female, and one of them was in contact in from ten to twelve minutes; but it had not remained longer than a minute when it was accidentally removed, and the female instantly passed a single egg. Union was again effected in an equally short length of time, but the female endeavoured to escape, and did not receive the attention of the male as might have been expected; in a few minutes, however, she became more quiet, and the male remained in contact. This second attachment commenced at exactly sixteen minutes after six P.M.; and the temperature of the atmosphere was then 66° Fahr. in the open air—the evening being moist but warm. The glowworms continued in contact for fifteen minutes, when the female began to crawl about, actively dragging after her the male, which maintained his attachment, though he lost it once for a few seconds; and while thus attached, the antennæ of the male were thrown backwards, and the head was drawn along under the thorax. The sexes now continued united for an hour and a half, and then separated naturally, the impregnation appearing to have been complete. At fourteen minutes before eight P.M. I placed them in a box, the bottom of which was covered with damp earth with a little tuft of grass, for the purpose of observing the time and mode of depositing the eggs. I now placed the vessel in the open air, covered with a thin gauze net to prevent the escape of the insects; the female continued for nearly an hour to crawl about on the grass and on the earth, still emitting her light, but with only moderated brilliancy, while the male was concealed beneath the grass and remained perfectly quiet as in repose. At five o'clock on the following morning, when the temperature of the air was about 60° Fahr., the female continued in motion with the male still flitting about her, but the two were not in contact. I now examined the vessel and the tuft of grass very carefully, but no eggs had yet been deposited. I then covered the vessel, so as to exclude light as much as possible, and placed it in a dark room. At eleven o'clock in the day, when the atmosphere was at 65° Fahr., the male was still in occasional attendance on his partner, but no eggs had yet been deposited by her. During the remainder of this day and in the evening, the attention of the male was undiminished, but on the following morning I found him dead. The female, however, did not begin to deposit her eggs until the next evening. The conclusion to be drawn from this experiment seems to be, that, though the female is impregnated at an early period after

quitting the pupa state, the eggs may not be deposited for twenty-four to forty-eight hours after impregnation.

In the following year (1842) I had an opportunity of repeating this observation. Having carefully preserved some larvæ of the glowworm through the preceding winter and spring, and succeeded in rearing pupæ and perfect insects from them, I found on the morning of the 18th of June, the temperature being at 67° Fahr., that four female glowworms had assumed the perfect state, and that two of these had begun to shine very brilliantly. There were also two male insects; these had not yet assumed the perfect form, but were still pupæ; and as the whole of these had entered the pupa state about the same time, it would seem that the males remain longer in that condition than the females. During the night between the 20th and 21st of June, the two males also threw off the pupa-covering, and their elytra remained soft and pliable, being liable to injury for several hours. On the evening of the 21st, the males began to pay attention to the females, and on examining the insects at five o'clock on the following morning (June 22nd) I found them *in coitu*; at three o'clock in the same afternoon, when the temperature of the atmosphere was 70° Fahr., the boxes which contained the glowworms having been placed in a dark closet, they were still attentive to the females, and I found that some eggs had been deposited at the roots of the grass. One of the males was very attentive to the female that appeared to have deposited the ova. This female was shining much more brilliantly than the others. The fact of eggs having been deposited by one of these females within a very few hours after copulation, while in the former case eggs were not produced until nearly two days had elapsed, seems, when the relative time of the females leaving their pupa state is considered, to confirm the conclusion above stated, namely that when the female has been abroad for a day or two before being impregnated, the ova, being already fully matured, are then deposited very soon after the communion of the sexes; while, if the female is brought into contact with the male very quickly after leaving the puparium, the ova may not be deposited for one or two days afterwards.

The deposition of eggs, which had commenced on the 22nd of June, as mentioned above, was continued: at half-past ten on the morning of the 24th, when the temperature of the atmosphere was about 65° Fahr., I found that an abundance of eggs had been deposited. A few of these were on the stems and blades of the grass, but by far the greater proportion on the small exposed root-

fibres; this, therefore, appears to be the habit of the insect. The males continued to pay attention to their partners, which were still engaged in the act of deposition, so that repeated impregnation may be necessary, perhaps, for the full impregnation of all the ova. On the 25th of June, at ten A.M., I removed some of the eggs to a glass tube, closed at each end by a cork, for the purpose of observing their development; as there is some difficulty in doing this when the eggs are repeatedly exposed in the observations.

I now observed that the males were beginning to pay less attention to their partners; so that the season of shining is followed quickly by that of pairing and the deposition of the eggs; and when the latter takes place quickly after pairing, the female has already been in communication with the male, or has been for some days abroad.

On the 26th of June, in the afternoon, when the temperature was near 70° , all my glowworms, both male and female, were still living, but the former ceased to pay any attention to the latter, and these were not depositing any ova.

On the following day, however, June 27th, a few more eggs were deposited, and one of the males was again attending to and flitting about the female; but after this day all further attention entirely ceased, and the males died. The light of the females also became exceedingly faint, and was shot forth only feebly at intervals. In a few days these also died. I am not prepared, however, to state whether these invariably die after depositing their ova, as I believe, or whether they continue to feed and live on until the following year. It is quite certain that they take some nourishment in their perfect state, but this is not the case with the male.

In connexion with the deposition of the ova, it is interesting to mark the way in which that process is conducted when the union of the sexes has not been effected. Thus, if it happens from the absence of males that the glowworm has not been impregnated within two or three days after quitting the pupa, the light is given out for one or two evenings with increased intensity, and is constantly exposed to view in the manner before described; whilst the insect appears to be greatly excited, and alternately moves from place to place, resting on the ground or climbing to the extremity of blades of grass, changing the position of her body and the light, and shining with greater brightness, but no eggs are deposited. Like many other insects, and more especially the females of some *Lepidoptera*, the glowworm retains her eggs for a

very long time when unimpregnated; and if at the end of several days impregnation has not occurred, the natural instinct of the creature becomes markedly affected, precisely as I formerly pointed out is the case with the female *Meloë* under similar circumstances (Linn. Trans. vol. xx. p. 302). Her body becomes greatly distended by the fully matured ova within her; the light loses its brilliancy and is less constantly exposed, and its colour is changed to a greenish hue. She wanders about, with evident distress, less rapidly, but more constantly, and ultimately deposits her eggs at random on the grass over which she travels, or even on the ground, one or two at a time. A very slight mechanical stimulus of touch or pressure on her body will then occasion her to extrude an egg, but nevertheless she is extremely tenacious of life, and lives on until very many of her ova have been carelessly extruded and scattered. After some time she dies. In one experiment made to ascertain the length of time the glowworm may live unimpregnated, I found the light given out with greater brilliancy on the second evening after the glowworm had been in confinement; with still greater on the third and fourth, at which time the little prisoner was evidently in great distress, alternately traversing the sides and bottom of the box in which she was confined, then remaining stationary for a few minutes and emitting her light with its utmost vividness,—it being at one moment very bright, and then slightly dimmed for a few seconds, but only to be shed again at the next instant with greater brilliancy. The insect was strongly attracted by the light, first to the one side and then to the opposite; and the sexual impulse was manifested by the frequent protrusion of the vaginal portion of the body. On the fifth evening the light had become fainter; and from this time to the tenth day, when the insect died, the light continued to diminish in brilliancy, and became of a much greener colour.

At the moment of the laying of the eggs, each is covered with a very glutinous and adhesive matter, as I have found when an egg has been extruded from the body beneath my eye under a lens. They are affixed firmly by means of this matter to the small exposed roots or the base of the stems of blades of grass, though not in the ground as some have stated, but close to the surface; so that, without being covered by the soil, they are constantly retained in a humid locality, and yet are freely submitted to the influence of heat and air,—conditions which I have constantly found absolutely necessary for their development. Some naturalists have stated that they are usually deposited on moss; but this condition,

I believe, is not usual. I have always found my specimens in confinement attached as stated to the exposed roots or stems of grass, whence the larvæ, when hatched, are most likely to find their prey near to them, and where they are constantly in a damp place, and in a situation in which all their requirements are best supplied.

Supposed Luminosity of the Eggs.

It has frequently been stated that the eggs are luminous, but of the truth of this there is considerable doubt (Rogerson, Murray, Tiedemann): they certainly are slightly effulgent soon after they are deposited, but this, I consider, is due rather to the matter with which they are covered when extruded, than to any inherent property of their own. With the view of ascertaining the truth of the statement, I have examined the ova both within and without the body. In the female which had died unimpregnated on the tenth day after capture, the ovaries were filled with ova, and when placed in water before removal from the body appeared to emit a greenish light; after three hours' immersion they still appeared, when the specimen was carried into a dark room, to give out a very faint greenish light; but when they had been standing a few hours longer in the water, no light was perceptible from them: the light appeared to have been due to what was transmitted through them from the segments. I then opened the body of a female that was still living, but which had deposited a large proportion of her eggs; and on carrying the specimen into a dark room, the remaining ova appeared to be luminous, like the preceding; the specimen was then immersed still living in water, and the ova appeared to be more luminous than before. The entire ovaries containing the ova were next removed from the body beneath water, placed in a separate vessel, and carried into a dark room, but no light was then emitted by them. They were as opake as those of other insects; so that the light which they appeared to give out before removal from the body, was due in reality to that of the light-giving segments, being transmitted through them. The segments themselves, after the eggs were removed, still emitted light very powerfully, although immersed in water, and continued to do so for nearly five hours, while the insect lived, and almost as brightly as when the insect is uninjured. In a third instance, which was examined at the same time as the preceding, I found the ovaries, when opened in the air, full of ova, but these were not luminous. On placing the insect in water, the eggs then appeared to give

out a faint light, but after immersion for an hour or two they ceased to shine. When the ova and ovaries were removed, I found that the segments gave out only a very faint light, although the insect was still living, and light continued to be given out from them for several hours, but very faintly. It was thus evident to me that the ova which are within the ovarium certainly do not emit light before deposition, but merely transmit that of the segments beneath them; but when the ova are deposited, I am inclined to admit that a very slight luminosity is sometimes apparent, though this is due rather to the fluid covering of the egg than to the egg itself.

The Development of the Embryo.

I have stated that some of the eggs deposited between the 22nd and 25th of June were removed into a glass tube, still attached to the roots of grass to which they had been affixed. This was done in order that the eggs might not be affected too much by warmth and dryness during examination, as when they are long exposed, or have not sufficient moisture, they quickly dry up and are destroyed. If, however, they are enclosed in a tube, and the interior of the tube only very slightly moistened occasionally, then the eggs become developed as in the natural haunts. I did not observe the development of the young *Lampyrus* within the eggs, as opportunities were wanting for my so doing, but only watched that of the egg itself, and the time of appearance of the young. The tube with the eggs was placed in the same box and under the same circumstances precisely as some of the same brood of eggs which still remained attached to the roots of grass. In both these sets I found that at about the 25th or 28th day after the eggs had been deposited they were considerably enlarged,—a certain sign that their development was in progress; this increase was very distinctly marked at this time, viz. about the middle of the period of development of the embryo, in accordance with what I have before and since observed in the development of other species of insects and in other broods of eggs of the glowworm itself, as well as in the *Iulidæ* (Phil. Trans. 1841).

On the 7th of August I had the satisfaction to find that the eggs in the tube, which had been deposited between the 23rd and 25th of June, were producing their larvæ. I had been prevented during the interval from watching minutely the daily progress of the eggs, and I am unable to detail the steps of the formation in

this insect: I had noticed only that the egg had considerably increased in size, but had not in any way changed its colour. It, however, appeared now to be slightly effulgent on the day before the young appeared,—a phenomenon which I subsequently found to be attributable to the embryo within. I saw one specimen immediately after leaving the ovum: at first it was coiled up and inactive,—a circumstance which I attribute to its being still enclosed in the amnion after the shell has burst. It was then of a very delicate straw-white colour, and for a few minutes quite inactive: as soon, however, as its body is stretched out and the amnion removed, it begins to move very feebly, but after a short time with more strength. Its colour also begins to change, the white becoming of a darker shade, and in less than half an hour the whole body is tinged of a very light grey. In the course of two or three hours this colour becomes much darker, and after some hours longer it is of a dull black, like the body of the parent. Its body is then composed of thirteen segments, including the head, and it moves with considerable activity; its onward motion being mainly effected by means of the anal segment, which serves the purpose of the prolegs of herbivorous larvæ in assisting the progress of its body.

The length of time which these eggs had occupied in development was thus on the average about forty-five days, or a little more than six weeks. The other specimens, which had remained in the box attached to the roots of grass, were hatched in about the same time; but the period of incubation was shorter by ten or twelve days than that occupied in the development of a brood of glow-worms' eggs in the preceding year, when the temperature of the season was very much lower with rain.

During the time the specimens above referred to were in course of development, the heat was above the average, for at the latter part of the time on one day it was 86°, and on more than one it ranged from 76° to 78° Fahr. This result agrees with that derived from the observations I have before and since made, viz. that the more or less rapid development of the embryo is mainly dependent on differences in the amount of heat supplied to it from without.

The Food and Habits of the Larva.

Six days after the larvæ were hatched, I supplied them with their proper food—a portion of a living snail, which they immediately began to devour with great avidity. Before this they had sipped

the water added to the interior of the tube. The proper food of the larva was ascertained first, I believe, by Rogerson (*Philos. Mag.* vol. lviii. p. 63), who is quoted by Murray, in the year 1826; it was afterwards pointed out by M. Maille in the '*Bulletin Soc. Phil.*' Feb. 1826, also in the '*Annales des Sciences Naturelles*,' vol. vii. p. 353, and since then by a writer in the '*Penny Cyclopædia*.' The fact has since been re-stated and established with additions, by Rennie, in 1831*. Rogerson stated that the larvæ "feed on small snails, and the carcasses of insects, &c."

At the end of eighteen days the larvæ were still very active, and had grown considerably, but had not yet shed their skins; they had been fed during the interval on portions of a snail. On the following day (August 26th), or nineteen days after hatching, one specimen underwent its first change in casting off its skin, but exhibited no change of form. When the larva first escapes from the egg, the only change it experiences is that of colour: it becomes of a deep grey-black, with the margin and posterior angles of the segments of a whitish colour, and with a distinct white line along the middle of the back in the line of the dorsal vessel. After the first change of skin, the whole of the upper surface of the body becomes of a much deeper colour; the longitudinal line almost entirely disappears, and the angles of the segments are then white, and have also a reddish or flesh-coloured spot at the apex.

On the 15th September, or nineteen days after the first change, some of the specimens cast their tegument a second time, while others had only then just entered their first period, although the whole had been living under like conditions. I have constantly noticed similar differences, and am strongly induced to refer them to original imperfect impregnation of the ovum.

I had thus traced the individuals I had watched from the egg, to the second change of tegument in the middle of September, when by accidents most of them died; and I was forced to continue my observations on other specimens which had been supplied to me from their native haunts in the beginning of October.

A full account of the habits of the Glowworm was first given in the '*Bulletin Soc. Phil.*' Feb. 1826, and subsequently in the same year in the '*Annales des Sciences Naturelles*,' vol. vii. p. 353, and these memoirs are attributed to M. Maille. Rogerson, however, as mentioned before, had given a brief history of the insect, and had already shown that it feeds on snails. A particular account of the cleanliness of the larva is given in the '*Bulletin des Sciences*

* *Journal of the Royal Institution of Great Britain*, vol. i. pp. 16 & 19, 1831.

Naturelles,' June 1826, vol. viii. p. 296; and the same is also referred to by a writer in the 'Penny Cyclopædia,' in which are given some additional accounts of the voracity of the creature and its mode of feeding.

I am not aware, however, that any one has made observations similar to some which have been reported to me in a letter dated August 23, 1840, by my friend Professor Ellis. The writer in the 'Penny Cyclopædia' states that he kept the larvæ alive for a long time, and that they subsisted upon snails: "Attacking those of the largest sort sometimes, they would seize a snail whilst crawling, and when the snail retired within its shell they would still keep their hold, and allow themselves to be carried into the shell with the snail; and although they became enveloped with mucous secretion, it very seldom appeared to adhere to their bodies." Mr. Ellis wished to observe the proceedings here described of the larva being carried into the shell by the snail, and therefore furnished snails to some larvæ that he had in confinement. He was not able to verify the statements made by the writer referred to. On the contrary, he says: "Instead of witnessing that effect, I was astonished to find that the manner of destroying the snail was by a series of sudden bites, repeated at intervals; and I was moreover struck with the fact that the snail seemed in extreme agony after the first bite. I therefore made a number of experiments with snails, and the following are the results:—

"*Exp. 1.*—A rather large snail was bitten; it retracted after the wound of the glowworm into its shell, and had afterwards a partial paralysis (if I may so speak), inasmuch as it could not right its shell when crawling.

"*Exp. 2.*—Another, bitten in the horn, was not able, or did not protrude it fully for as much as a quarter of an hour afterwards; and put out only one (the opposite) for some time.

"*Exp. 3.*—Some smaller snails, bitten once by a large larva, never emerged from their shells afterwards, and it is now *eight* hours since, while one or two seemed to be dead.

"Perhaps you may think these effects are due to mechanical injury. I kept this also in view, and pierced some of the snails when crawling through and through with a needle, and fastened them thus to the table; but although they retracted into their shells as much as possible for the time, they came out again directly afterwards, and were to all appearance as well and active as ever—even those that had been impaled three or four times. These effects cannot be simply those arising from mechanical injury,

seeing the difference in the results. I therefore infer that there is some special poison inserted, or influence exercised, at the time of striking the prey, like that of the snake-tribe; and that the effect on the snail is proportioned to its size, for it takes repeated bites to kill a large one. I am further confirmed in this opinion by the fact that, when a dead snail is presented, the glowworm simply begins to eat slowly. The way in which the glowworms remove the snail, when killed, is interesting: they walk backwards with it, using the claws (prolegs) at the end of the tail as feet."

These interesting facts, communicated to me by my friend Professor Ellis, immediately led me to watch the proceedings of the glowworm. I had the gratification of witnessing every particular, and the opportunity of confirming what he had pointed out, as he had forwarded to me with the glowworms some of the same species of snail as those employed by himself. These snails proved to be the *Helix nemoralis*, and were mostly young individuals; but there were also some full-grown ones, and besides them was a small specimen of *Limax agrestis*. As a general result, I found that the larvæ attacked most fiercely and fed upon the former species of snail most voraciously, but would not touch the latter; their proper food therefore appears to be the *Helices*.

On repeating these observations, I at first thought that it was only the smaller snails which fell a prey to this larva, but I soon found, as stated by the writer in the 'Penny Cyclopædia,' that the very largest are also destroyed by it; for I have seen the full-grown and largest-sized *Helix* attacked by a single larva. I have not, however, seen the larva actually drawn into the shell by the snail, as mentioned by M. Maille, and I therefore suspect that was an accidental occurrence which is likely to happen, since the mode of attack, as M. Maille states, is by sudden bites, repeated, as my friend observes, at intervals, and, as I myself noticed, made by the larva with apparently great caution. So far from the larva being drawn into the shell by the snail, I have noticed that the frothy matter that is invariably given out by the snail when it returns into its shell after being bitten by its assailant, is particularly avoided by the larva. I witnessed the attack of a larva on a very large and full-grown snail while crawling. The larva raising the anterior part of its body made one sudden and very cautious bite about midway in the body of the snail on the margin of the foot, and repeated this by running backwards and forwards from the tail to the head of the snail. At each bite the snail seemed to be in great agony, and a greenish transparent fluid was

instantly exuded from each wound. In this way the larva continued its attack on the snail, running along the side of it from tail to head and back again, repeating its bite at each turn as the snail crawled along. It seemed to direct its chief attacks against the head of its victim, and in this it succeeded in two or three attempts. Once the snail was bitten at the base of one of the large feelers, and the effect was inability to protrude the organ to its full extent. I then placed this snail aside until the next day : although it had been the object of repeated attacks it was not killed, but only appeared to be a little paralysed. These experiments were made on the 27th of August, when the larvæ were in full activity. On the following afternoon I found that the specimen set aside had really been more injured than at first appeared ; it moved very feebly and slowly, and was unable to protrude the feelers on the injured side of the body to their full extent. The inferior margin of the body from the head to the posterior extremity of the foot was unused, irregular and shrunken, and the entire animal had evidently suffered greatly in health ; it appeared to be highly sensitive to light. I then placed near it a large larva, by which it was immediately bitten in the inferior horn on the left side, and the snail retired into its shell. Before it could withdraw itself completely, it was again struck in the margin of the foot on the right side, and the larva then passed quietly to the opposite side and wounded it there also ; then, just as the snail was about to reappear, bit it again twice, first in the inferior, then in the superior horn of the right side ; and when the snail made an effort to protrude the left horn, which had never recovered its original power, wounded it again in that also. After this, it was struck again on the margin of the foot on both sides, and the snail then seemed to be entirely incapable either of completely withdrawing itself within the shell, or of locomotion and attempt to escape. Its body soon appeared shrunk and corrugated, and writhed as if in great agony. It occasionally protruded a very small portion of its horns, but it seemed to have lost all power to project them to their full extent, the utmost length being then not more than one-half that of their original dimensions.

It was interesting to observe with what apparent caution the glowworm proceeded with its work of destruction. It protruded its head to the greatest extent from the thorax, extended its body backwards, and flexed and affixed it firmly by its prolegs, so as to obtain as it were a fulcrum against which it might direct its whole strength in the attack. When I removed the snail, in order

to learn whether it would ultimately recover from its injuries, the larva seemed perfectly disconsolate, turning its head about with extended mandibles in every direction, and watching like a dog at fault. A second snail was then supplied to it, which I shall designate

No. 2.—This also was a snail of the very largest size and perfect health. The instant it had left its shell and began to crawl freely along, the larva attacked it: it was bitten once in the inferior horn of the right side and immediately drew itself within the shell, but almost as quickly came forth again, though it did not protrude the horn. In a few minutes the snail had regained its full power of locomotion, and crawled slowly along, yet apparently in agony. The larva then ran quickly backwards and forwards at the side of its victim, with its head and mandibles extended, and watching for a proper opportunity to strike it again: it next passed backwards to the side of the snail as this creature crawled forwards, and suddenly struck it again in the under lip. The snail instantly retracted, and before the larva could disengage itself, drew it within the shell for a short distance; but this was evidently accidental, as the latter let go its hold, and, affixed by its prolegs, awaited the onward movement of the snail again. After this it gave its victim another severe wound, and the snail withdrew itself entirely. The larva appeared to search eagerly about for its lost victim, first in one direction and then in another. Soon after this it bit the snail within the shell, and this wound had the effect of occasioning the creature to protrude itself, and again it crawled along, the larva following in its track.

Observing how little injurious effect was produced on the snail by these repeated attacks of its assailant, I began to suspect that if the injury to the snail depended on the effect of any specific poison injected into the wound at the moment of striking it, that by the repetition of attacks on the snail No. 1, the virulence of the poison might have become exhausted, and the bites on this one therefore produce but little injury. Accordingly I removed this larva, and placed a second one in its stead to attack the snail, and certainly the result which followed the bites of this second seemed in some measure to justify the supposition. No sooner had this larva been placed near the snail than it struck it repeatedly in the head, the snail retracting at each attack, and appearing to suffer much more severely than from all the attacks of its first assailant: each wound appeared to be equally severe, until at last the snail shrunk into its shell. It did not appear, however, to be

able to remain within the shell more than a few minutes after being wounded, as it seemed to writhe in agony from the bites. These observations therefore do not seem to support the statement, that it is usual for the larva to be drawn by the snail into its shell; on the contrary, the instinct of the larva seemed to lead it to avoid this interruption to its attack, as before striking severely it invariably affixed itself firmly by its prolegs and curved the posterior part of its body in the form of an arch, as if for the purpose of affording a means of support, and allowing the entire body to be suddenly extended forwards to reach the object of its attack. On one or two occasions, when the larva made a very fierce bite, and struck its mandibles deeply into the wound as the snail was crawling at full length out of its shell, the larva was dragged along for a short distance, but I never saw the creature drawn into the shell by the snail. I now set aside this individual like No. 1, and placed a much smaller snail with the larva first employed. This I shall call No. 3. The size of this snail was not greater than that of a large pea.

No. 3.—The larva bit this snail once, and the effect was immediately evident, although this creature had so repeatedly bitten the larger snail; yet the power of locomotion was not destroyed. The specimen No. 4 was next exposed to this larva: this was rather larger than No. 3: it was bitten once in the head and retired within its shell. At the expiration of one minute it came out again, but its power of locomotion was affected, and it was unable to protrude its left horn. I now allowed this snail to be bitten by another larva which had not been employed before, and which was rather smaller than those before used: the snail was bitten once by it and withdrew itself, and seemed to exhibit effects of something more severe than the simple wound. This snail I put by like the former.

Another specimen, No. 5, was now employed: this was rather larger than the two preceding, but not so large as the first two; it was also bitten once by the larva last employed. This specimen as yet had been perfectly uninjured. The larva seemed voracious and active; it bit this specimen slightly at the extremity of the foot, and I allowed it to bite again the head and neck. The snail, when bitten on the head, instantly retired and threw out abundance of froth; it soon emerged from the shell, and attempted to crawl, but it was unable to keep the shell upright on its back; it then retired within, and again came forth from the shell with apparently a little more power. I then allowed it to be bitten

again on the mouth, and it again withdrew itself. By this time it was evident that the snail was much injured, and I allowed the larva to feed upon it.

I then placed a healthy snail, No. 6, about the size of those just noticed, and allowed this to be bitten once by a fresh and hitherto unemployed larva. The wound in this was in the head: the snail withdrew into its shell and never came forth again; and two hours afterwards I found that it was completely dead. This experiment induced me to think, with my friend Professor Ellis, that the bite of the glowworm is peculiarly poisonous to the snail, although I was uncertain in what way it produces its effect. It was evident from all the previous observations, that, even after the first bite from a larva that had already expended its force on other snails, the bitten snail writhes and seems to be in great agony; and if a young individual, it often dies from this single wound in a state of contraction or kind of convulsion, giving out at the time a sanious fluid.

The circumstances noticed in these detailed experiments with regard to the little effect produced on different snails by the same larva which had previously bitten many successive times, and the very marked result which instantly followed the bite of one which had not before been employed, seem to support the opinion that a fluid, which is poisonous to the snail, is injected into the wound by the larva at the moment of its bite, and that the effect produced is diminished in the ratio of the number of times the larva has already bitten: precisely as in poisonous snakes, in which, as also in the glowworm, we may suppose the want of power to produce death may be due to exhaustion of the supply of their secreted fluid, or to its imperfectly matured secretion and dilution with other fluids.

I may mention here, in support of the view that a poison is injected, that I have noticed, on watching some larvæ which were preparing to attack the snail, a transparent fluid oozing from its mouth and extended mandibles. Whether this fluid is secreted by distinct poison-glands, as is the case with the centipede and with serpents; or whether it is merely a profuse flow of saliva, which may act as a poison on the prey, is yet a subject for inquiry. Certainly such a fluid is produced, and the mouth of the glowworm is filled with it to overflowing at the moment of its attack. I have witnessed the same thing in the *Carabidæ* and in the *Silphidæ*, both of which generate an abundance of dark-coloured foetid fluid from the mouth at the time they are feeding, though this I am

inclined to regard as the proper saliva of these insects. At one time I thought I had detected two poison-glands, in the form of two sacculated salivary vessels, in the perfect female glowworm, but I was not able to confirm this dissection in other instances. It is not improbable that the fluid exuded by the mouth may be secreted by the stomach; as in one instance, while a larva was attacking a large snail, I observed that its mouth was flowing with a blackish fluid which it subsequently regurgitated in considerable quantity. It was similar in appearance to the fluid ejected from the salivary glands or the stomach by the larva and imago *Carabi*; and it seems probable therefore that the fluid of the *Lampyrus* is of the same kind.

That the effect of the bite on the snail was not simply that of mechanical injury, I am of the same opinion as my friend above quoted, since, like him, I struck several snails through in every part with a needle, and wounded them ostensibly far more severely than did the larva; and yet they appeared not to suffer half so much inconvenience, nor give evidence of agony by their peculiar contortions, but moved away with as much activity as before: their movements were not in the slightest degree impeded. One snail, which I repeatedly struck through the head and neck, and impaled on the table, seemed quite unaffected when released, and appeared, if there was indeed any difference in its speed, to move a little quicker. Even although I pierced this specimen through the head twice, close to the cerebral ganglion, it did not appear to be seriously injured: it withdrew for an instant within its shell, but soon came forth again and moved away with as much ease and speed as before, and was alive and apparently quite well on the following day. Another and much larger snail, pierced twice through the stomach and head, crawled away as readily as when uninjured; but when this same specimen was afterwards bit once by a larva which was only of moderate size, the snail withdrew into its shell, and was completely dead within two hours.

Although the mechanical injury inflicted by myself on this last snail had not produced any marked result, the effect from the bite of the larva of the glowworm was instantaneous, and reminded me strongly of the action of some deadly poison injected into the body of a vertebrated animal, as that of the viper, &c., only that it was more rapid and approximative to the effect of an electric shock.

The repetition, extension, and variation of the experiments of Professor Ellis prove:—

That the single bite of a larva of the glowworm will infallibly

kill a small snail, of about the size of a large pea, in less than two hours.

That two or three bites are usually required to kill a snail about the size of a small bullet.

That the effect produced by the bite is not that of mere mechanical injury. Nor does it appear that a bite at one spot is more fatal than at another; for although the larva usually attacks the head of the snail, it wounds it in other parts also with similar results. But if the snail is very large, instinct prompts the glow-worm to bite it two or three times at the foot, before venturing to strike it on the head.

That even when the snail is twice pierced through its head with a needle near the cerebral ganglion, or through its body, but little effect is produced, though when this same snail was bitten by the larva it was dead in two hours.

That when two small snails about the size of grapes were employed, one being pierced through and through with a needle, and the other not so injured, but bitten once only by a large larva, both snails immediately retired into their shells; and that whilst the bitten one never came forth again and was nearly dead at the end of two hours, the other snail was alive and apparently well on the following day.

I noticed also that, although a snail may be bitten once by a small larva and not appear at the time to have been much injured, yet it frequently dies after some hours. This fact still further tends to support the view that some poison is injected, or some serious derangement of the vitality of the snail is occasioned at the time of inflicting the wound, and to confirm it in a negative way by the fact, that if the larva be allowed to exhaust its force, of whatever nature this may be, by repeatedly biting a snail, and then be employed to wound a very much less snail, the effect it produces is far less marked than if it had not previously bitten any.

What is the nature of this influence? Can it at all resemble that of the shock of the electric eel or of the torpedo, both of which we know become exhausted by the repeated use of their power; or can it resemble that of the ray or stinging skate, which is believed to inject a poison with its sting?

But although the effect is fatal to a small snail, even when the larva has previously exhausted its force, it is yet exceedingly slight in the latter case, when the creature is allowed to strike a large snail. On one occasion I employed a full-grown larva which had been used before, to attack a full-grown *Helix* that was as

large as a walnut: the larva struck it repeatedly without killing it. I saw the creature wound the snail at least from thirty to forty times. On the following day the snail was living and able to crawl, but was so much injured that it was unable to balance its shell, and moved along with it tilted on one side. Its progression also was impeded, for it moved very slowly, and kept its feelers depressed, and nearly close to the table over which it was crawling, as if looking out to avoid danger, moving one horn on one side and then the other on the opposite. This was twenty-four hours after it had been injured. I next put a very healthy full-sized larva to attack it. At first the snail did not appear to recognize the danger, and actually crawled over the back of its enemy; but very soon its danger seemed to become known. It appeared to recognize its foe, and continued to crawl round him in a circle, even when placed in a straight line before the larva, as if to avoid the danger. The larva soon bit it on the head, and the snail drew back, but not into its shell; a second wound was then made in the foot. On examining the wound with a lens, after each bite, I observed some dark-coloured sanious fluid upon it, such as I have seen flowing from the mouth of the larva.

From what I have above stated, it will be seen that it is by no means a common occurrence for the larva to allow itself to be drawn by the snail into the shell, since it usually attempts to retain firm hold, by means of its prolegs, of whatever it may be moving over, before striking its prey; but it is occasionally drawn into the shell when it attacks large individuals. I saw one larva bite a large snail fiercely in the head while the snail was crawling, and as the wounded animal instantly withdrew itself before the glowworm could detach itself, the latter was drawn more than half its length into the snail's shell, and had its head and body compressed by that of the snail. This position, as appeared from the struggles and rotation of the body of the larva in attempting to relieve itself, was by no means agreeable; and it came forth covered with slime, and apparently not disposed to return very soon to the attack. On another occasion, when the snail, unconscious at first of the presence of its enemy, slowly crawled over it, and covered its whole body with slime, the insect withdrew, and did not return to the attack until it had rid itself of its filthy covering.

The Voracity of the Larva.

The voracity of the larva of the glowworm is extreme. When they are only about half-grown, they will attack fiercely any new

victim that may chance to be crawling near them, even though they may have fed plentifully on their prey but a few minutes before. Having killed a snail, they seldom leave it, except for a few minutes, until the whole of the body is devoured. They will remain for many hours with their heads buried in the body of the snail, gorging to the utmost, and plunging their small heads and erected mandibles into its viscera, which they continue to pierce and exhaust until all the juices of the body are drained. I have sometimes seen four or five larvæ crouched one upon the other, in a snail-shell, feasting and gorging upon their prey. In this latter respect they somewhat resemble in habit, as they do in general appearance and colour, the voracious larva of the Lady-bird (*Coccinella*) which preys upon *Aphides*. The glowworm larvæ will pertinaciously continue to attack and devour the snails until they are so completely gorged, that they can move but with difficulty, and yet at the expiration of half, and sometimes even but a quarter of an hour, during which they are motionless, as in sleep, or as if fatigued, they will return to their feast as voraciously as before.

Cleanliness of the Larva.

Although the larva manifests such an avidity for food, and continues to gorge itself so long and so pertinaciously, with its head thrust into the snail, and its body buried in the shell amidst the decomposing corporeal elements, it is nevertheless very diligent to cleanse itself of the slime. M. Maille (*loc. cit.*) first mentioned this circumstance, and pointed out the organs which it uses for that purpose. Degeer, however, long ago referred to the structure, but did not observe its use.

After the larva has finished its repast, it leaves the snail, as I have seen, retreats a short distance beneath the roots of grass, and begins to cleanse itself from the adherent slime. This process is effected, as mentioned by Maille, by means of the anal prolegs, protruded from the thirteenth segment, which I shall more particularly describe hereafter. With this apparatus, which the author referred to says is "*une espèce de houppes nerveuse composée de 7 ou 8 rayons blancs*" (Bulletin des Sciences Nat. p. 297), but which consists in reality of a number of fleshy radiations, muscular, not nervous, and capable of being greatly elongated, the larva grasps its mandibles, and wipes them and every part of its body to which any slime adheres, using its organ in the manner of a sponge or tail to wipe away the offensive matter. When the

slime has become adherent to the body and is partially dried, the creature seems to have the power of detaching it, by curling the posterior part of the body round in every direction, and using the apparatus in the manner of a hand or claw for that purpose.

The Luminosity of the Larva.

The luminosity exists at the very moment that the embryo is escaping from the egg-shell and amnion. At that time a faint light is given out from the ventral surface of the anal segment of the being that is starting into active existence. I have repeatedly seen light emitted from those parts on each side of the twelfth segment, when the little creature has but the minute before been liberated, and is still a feeble creeping body of a pale straw colour, and not one line in length. Macaire also mentions the fact (*Journal de Physique*, July 1821, tom. xciii.) of having seen the light in larvæ that had just quitted the egg, and were of the size mentioned above. I have found the light given out most vividly when the little body has been suddenly disturbed or slightly compressed.

I have noticed the light at this early period in all my specimens reared in the closed glass tube, as well as in those produced from eggs still attached to a tuft of grass-roots in the soil. Even at this early period I have found that the little insect may be induced to give out its light more brightly than usual, when it is placed in a tin box, and agitated slightly by shaking this in a dark room. The light then emitted resembles two very minute brilliant points, the brightness of which is constantly varying and twinkling, like stars of the smallest magnitude in the heavens.

It is thus evident that the same influence that occasions the perfect glowworm to shine with increased brightness, operates equally in the very young larva. And as the light is given out by the larva from its birth, there is reason to think that the luminosity of the egg, at the later period of development of the embryo, is not due to any luminous property of the yelk-tissue, but to the special light-giving organs of the embryo.

But although light has been observed at this early period of the larva only by Macaire and myself, it has been long known that the larva, at a later period of growth, emits light. This was noticed by Swammerdam (*Bibl. Nat.* p. 124), and afterwards by Degeer (*Mém. de l'Acad. des Scien. Paris*, tom. ii. p. 261), and since by Schmidt, Macaire and Todd; and Burmeister has shown that the larva of *L. splendidula* is also luminous.

I have found the light of the larva of *Lampyrus noctiluca* to proceed from two little lobes on the ventral surface of the twelfth segment, which are the only parts that transmit light in this larva. The light, when the larva is nearly full-grown and full-fed, in good health, and placed in a warm atmosphere, is at times almost as brilliant for a few seconds as that emitted by the perfect insect. But it is of short duration, and its degree of intensity is not sustained; besides which, it is of a greener colour, and is given out only when the insect is in motion: even then the light is emitted only in flashes or scintillations. This fact, however, is of some interest with reference to the nature of the light itself, its emission being hardly referable to a phosphorescent property of secreted fluid, but more probably to discharges of vital force through nervous function.

In support of this view, it may be said, that when the young larvæ are violently shaken and driven against the sides of a box, they emit their light more brilliantly; and that the full-grown larva, under such circumstances, gives out its light for a short time almost as brilliantly as the perfect insect. The larva seems, like the perfect insect, to have some control over its light, or at all events to become excited to emit it under certain circumstances. Thus, I have noticed that when the larvæ had been exposed for a short time to artificial light, they did not shine, or but very feebly; but when the light was suddenly removed, they at first gave out not a single gleam of light, though in four or five minutes afterwards one or two began to shine; and when they had remained undisturbed in darkness from a quarter to half an hour, most of them were shining.

I have found that the larvæ shine during the whole night when undisturbed. I placed a collection of larvæ which had fed voraciously during the day, in a glass phial, which was placed on a table by my bedside on a dark night; and being awake during the greater part of the night, I observed them shining at twelve, at one, at two, at three, at four, and even so late as at five o'clock, but always far less brightly than the imago. The creature thus appears to have some control over the emission of its light in a state of rest, for I have seen them shining when undisturbed during the whole of the night. On the other hand, when they have been exposed to light, either artificial or that of the sun, it was found, when the illuminating influence was suddenly removed, that they had ceased to shine; but after remaining in darkness for a few minutes, they gave out their light again, and continued to do

so steadily until disturbed or again exposed to light, when they ceased to shine, becoming luminous again after a short interval, when the light was again removed.

Another circumstance also which influences their shining is deficiency of food. It is only when well-fed that they give out light more brightly; for if deprived of food, the light is then very feeble.

All these circumstances tend to show that the light is greatly influenced by physical causes, and that those physical causes which operate generally on the body, or health, or vital force of the animal itself, as food, motion, heat, are precisely those which affect the production of light.

The Growth and Hybernation of the Larva.

It constantly happens with insects as with other animals, that when many individuals, constituting one brood, are hatched at very nearly or exactly the same time, some of them grow more rapidly and arrive at their completion much earlier than others. This is precisely the case with the larvæ of the glowworm. Owing to this circumstance, some individuals undergo their changes more rapidly, and attain to their imago state sooner than others, but having reached that stage and performed the great intent of their being, their life is rarely if ever prolonged beyond that of their fellows in a similar state of existence.

This difference in the rapidity of the growth appears to depend on physical causes, as for instance the more complete development of the constituents, and the subsequent more complete impregnation of the ova from which these precocious growths are produced; the greater amount of nourishment which the young have taken during corresponding periods of time; and generally the circumstances in which the whole brood have been placed in regard to light, heat, air, locality, and quality of food. I have usually observed that the larger beings came first from the egg, and appeared more robust and healthy than those subsequently produced; further, that a difference of but a very few hours in the earlier hatching of these individuals is followed by a much greater difference than can be accounted for merely by the length of time between the birth and the first and subsequent changes which the several individuals undergo.

Another circumstance of very great importance, since it is applicable to all beings, is, that the facts first noticed being taken

into consideration, those become the most healthy and most matured individuals to which food in full abundance is supplied during the earlier periods of existence. Improper food, or food in too restricted quantity at this period, more affects the rapidity and extent of growth during the subsequent periods of the life of this insect, and probably also of other animals, than deficiency of proper nourishment at any farther advanced stage. Not only are the changes of the animal retarded by this deficiency, but its full development is rarely if ever attained. I may mention, in support of this statement, that there was a difference in the period at which the eggs of the glowworm, placed in the glass tube as I have mentioned, were deposited, of only *ninety-one hours*, namely from three P.M. June 22nd to ten A.M. June 26th; but there was a difference in the hatching of the larvæ from these very eggs of nearly *eight days*, or more than *one hundred and ninety hours*, namely from the morning of August 7th to that of the 15th of the same month, although during the whole period of six weeks' incubation, all the circumstances under which the whole of these eggs were placed were exactly the same. I have constantly noticed like circumstances in the development of other insects, the *Forficulæ*, *Meloë*, and others, and regard the facts stated as of general application in development.

These facts may help to explain what otherwise might seem to be the result of imperfect observation, viz. that the larvæ of the same brood of glowworms do not all undergo their changes at the same time, or even attain their maturity in the same year, although developed from the egg in the same season. For instance, the most advanced individuals of those reared in the tube, underwent their *first change* on the *nineteenth day*, and the second also in the same length of time, *nineteen days*; but others had not then entered on their *first*. This was on the 15th of September. Some individuals of other broods obtained from their native haunts, I found had undergone this change as early as the 1st of that month.

The very earliest periods of development of the glowworm are thus of considerable length, and exceed that of the majority of insects. The Sphinx larva undergoes its first two changes, if at the same season of the year and at nearly the same temperature of the atmosphere, within *thirteen days*, those of the glowworm being *thirty-eight* (Phil. Trans. 1837, p. 315). But in proportion as the temperature of the season diminishes, so is the length of time which the larva continues before changing increased, the amount of food supplied, heat, and other circumstances being the same. But inde-

pendently of any diminution of temperature or supply of food to the larva, the interval of time between each successive change is progressively increased; and this occurs in the larvæ of all insects, and perhaps the young of all animals. So that at last a very long period may elapse between the young glowworm's penultimate change of skin, and that by which its larva or simple period of growth is terminated, by its assuming the quiescent state of a nymph; and if any yet earlier changes are retarded, either through late development from the ovum or insufficient supply of food, or through the influence of external physical causes, its growth is arrested, and the animal does not complete its development as a larva until the following summer. Thus the changes of the being are influenced by *physical causes*, and subject to *physical laws*.

It is only by reference to these circumstances that we are enabled to understand how the glowworm occasionally passes more than an entire year without undergoing its metamorphosis to the perfect state, seeing that this its latter stage is always attained in the month of June and July in this country. Yet the concurrent observations of naturalists have shown that this is the case. Rogerson noticed that it may be a year and nine months before it becomes a perfect larva; and I have certainly found this to be the case in some under my own observation. As my specimens were numerous, I was enabled to observe their habits during the winter and their change to the perfect state; but as I had by accident lost most of the brood I had reared, and watched to their second change, my observations were made on others supplied to me at the end of September from their natural haunts. I preserved them in an earthen vessel partly filled with mould and a turf of grass, and secured at the top with gauze. An abundance of *Helices* were supplied to them, and some of the larvæ seemed almost never to desist from feeding. I put with these the only four remaining specimens of the brood I had reared. The whole continued to gorge to repletion during the first part of October, and gave out light freely when touched, or in any way compressed. The temperature of the room in which they were kept was at this time ranging from 50° to 55° Fahr.

In the evening of the 18th of October, when the temperature of the room was 50° Fahr., the larvæ were still active and feeding; they were very healthy, and some of them were shining—one very brightly.

On the 25th of November I found them still feeding, but the largest were less active in their movements; they seemed to be in

quest of moisture, and most of the food was consumed. On adding water to the soil, they began immediately to sip the fluid. Others were at rest in a state of partial torpor in the emptied shells of some of the snails which they had devoured. They seem to use these shells as their hybernacula, taking food at intervals and then relapsing into a state of repose. One or two, however, were partly buried in the earth. The temperature of the room in which they were kept at this time usually ranged from 40° to 50° Fahr. On one occasion at the end of August and beginning of September, I found the larvæ pass under the turf among the roots of grass, and desist from feeding: this occurred with specimens which but a few days before attacked the snails most pertinaciously and voraciously. The temperature of the season was then from 65° to 70° Fahr.

On the 30th of November, the temperature of the room having been a little increased during the last few days, the larvæ were again feeding as eagerly as before, and several of them now appeared to be very fat. Still however they sought food, but moved more slowly than heretofore.

On the 13th of December, the temperature of the room being then 51° Fahr., the larvæ were still in a state of hybernation: when touched they moved their bodies slightly, but did not attempt to escape. Even in this state however they still gave out light, the brightness of which was increased at the moment they were touched.

On the 22nd of December, the temperature of the room during the preceding night having been stationary at 35° Fahr., and at the time of the observation only 36° Fahr., they were still hibernating, and lay with the body contracted and the head partially drawn beneath the thorax: when touched lightly, they still moved the body. Some of them were reposing in the empty snail-shells. I had now an opportunity of observing that, in a dry atmosphere, even at this low temperature, they still continued to give out light; for when they were touched and turned on their backs, they not only gave out light, but that with greater brightness. A low temperature of the atmosphere therefore does not necessarily arrest their luminosity; and this fact seems to favour the view that the light is the result of a vital property, of the nature perhaps of the electric discharge of fishes, rather than of phosphorescence or chemical action.

On the 25th of December, when the temperature was 48° Fahr., they still remained hibernating.

On the 30th of December, on taking them into an atmosphere

of 60° Fahr. for a short time, they became aroused, gave out light, and moved about apparently in search of food.

On the 6th of January, when the temperature of the room had remained for a day or two at only 33° Fahr., that of the external atmosphere being then 28° Fahr., my larvæ were again in a state of hybernation, and when disturbed still gave out a faint light, but when undisturbed no light was perceptible: this I think still further confirms the view I have advanced, as at this low temperature the respiration of the insect was almost completely suspended. The part from which the light was given out was the two spots on the penultimate or twelfth segment.

On the 2nd of February, at a temperature of 45° Fahr., I found the specimens aroused, and apparently disposed to feed: some food was supplied to them, and they commenced feeding, but less eagerly than in the autumn.

From this time, during the months of March and April, they were supplied with food: many of them died; several, however, still remained to undergo their changes to the perfect state.

On the 28th of May, the temperature being 70° Fahr., my specimens were still feeding, and continued to do so until the 9th of June, a few days before which they ceased to take nourishment and became more inactive.

Change of Tegument of the Larva.

I have not been able to ascertain with precision the number of times the larva changes its tegument before arriving at its full size. I believe, however, there are four changes. The mode in which this is performed differs from that of many other larvæ, as it has been correctly described by some observers.

I have several times witnessed the operation. It is effected by a lateral fissure on each side of the prothorax and mesothorax, extending forwards to the neck behind the head, so that the whole may be elevated like the lid of a box, out of which the larva first presses its thoracic segments, and then withdraws its head and the organs of sense, and the legs, slipping backwards the skin to the extremity of its body.

At the time of the larva leaving the skin it is perfectly white and colourless, delicate and easily injured, and when disturbed or touched gives out its light more vividly. Immediately the tegument has been cast, the larva coils itself up in a circle, and seems forcibly to extend all the segments of its body, protruding

its head and neck to their fullest extent, as well as its anal appendage. Although the creature is so courageous at other times, it is now very timid and takes no food for several hours: indeed it will not venture near a snail to attack it, as if conscious of its present weakness.

One specimen which changed at ten o'clock in the evening became shining and active, and acquired its dark colour at the expiration of twelve hours; but it did not venture to take food for several hours afterwards.

The Nymph.

On the morning of the 9th of June one of the larvæ cast its skin, and assumed the condition of a nymph. This specimen was a female; but a male specimen had already changed to the same state only a few hours before. At mid-day, when the temperature was 75.5° Fahr., a second female assumed the same condition; and on the evening of that day at six P.M., when the temperature was 77.5° Fahr., two others, one male and one female, also changed. At ten P.M., the heat being still so high as 72° Fahr., I found the whole of these giving out an abundance of light; the females, although undisturbed, were exceedingly luminous, and the males shone almost as brightly as the perfect insect in its state of greatest activity.

It was quite evident that in the quiescent state of a nymph, the emission of the light was not the result of any direct influence of the will or instinct of the insect; it was simply the result of the *vital forces* of the body, the manifestation of which seemed to be greatly augmented by the very high degree of temperature of the atmosphere. It was interesting also to notice that the whole of the specimens, three females and two males, underwent their change on the same day, in which the weather became much warmer than for some days previously. The light emitted by these insects was apparently in a ratio corresponding to the increase of heat; the rapid increase of the temperature operated nearly equally upon the whole in inducing their transformation to the nymph state, within a few hours of each other; and, as we shall afterwards learn, the same external force equally accelerated their development when they had assumed this condition.

The mode in which the change to the nymph state is effected is precisely that of the shifting of the skin by the larva; but the result of the change is different, in consequence of the operation of

laws of organization, which I shall attempt to explain in connexion with the anatomy of the insect.

The form which the insect assumes as a nymph is that of a semicircular body.

The Imago.

On the 16th of June, the temperature of the atmosphere being then 73° Fahr., and it having been likewise at nearly the same height during some preceding days, the three female specimens threw off their nymph covering and assumed the *Imago* state: their change was thus completed at this high temperature in *seven days*,—a very marked instance of the influence of increased heat in accelerating the metamorphosis. M. Maille found that his insects passed *fifteen days* as the interval between the larval and perfect state, namely seven days of quietude in assuming the form of nymph, and *eight* full days in the nymph state (Bull. des Sc. Nat. viii. 297). But some specimens which I reared from the larvæ in the summer preceding this, left the larva state about the 25th of May, and at a much lower temperature of the atmosphere than those now observed.

The pupa-covering is exceedingly thin and delicate; and not only during the pupa state, but immediately when they became perfect insects, my specimens shone very brightly. The tegument thrown off by the larva on becoming a pupa is solid and of a dark colour, but that of the pupa, shed on assuming the imago state, is almost colourless, and very thin and transparent.

The two male specimens, which assumed the nymph state at the same time as the females, did not reach the imago condition until the night of the 20th of June, and were thus *eleven days* in the state of nymphs, so that the females appear to become perfect much earlier than the males. This fact is of importance with regard both to the natural history and the relative anatomical development of the two sexes. The female undergoes but little change in her anatomy, and continues in a semilarval condition; consequently she is most early fitted for leaving the puparium, and is ready to receive the male, whose life is very limited.

From the individuals thus produced, I may simply state that I succeeded in again observing the deposition of eggs and the hatching of larvæ.

We are now prepared, by the consideration of the natural history, to proceed to the description of the anatomy of the glowworm, which will form the subject of a future paper.

On the Quantity of Tannin in the Galls of *Cynips Quercus-petioli*.
By EDWARD HART VINEN, Esq., M.D., F.L.S. &c.

[Read February 19th, 1856.]

MUCH interest has been excited by the frequent occurrence in this country of the galls of *Cynips Quercus-petioli*, and they appear, from a recent communication in the 'Gardeners' Chronicle,' to have increased to such an extent during the past season, as to do vast mischief to the trees infested by them, rendering them unproductive of acorns, and even threatening their entire destruction.

In a recent conversation with Mr. Westwood on this subject, he informed me that these galls had been used in Devonshire for the purpose of making ink, and at the same time suggested that it would be desirable to know whether they contained sufficient tannin to render them useful substitutes for the ordinary galls of commerce. At his request I undertook to ascertain this, and thought the result might be sufficiently interesting to communicate to the Society: the following is the result of my examination. By macerating 100 grains of Devonshire galls in æther and water, a residue was obtained weighing 26·74 grains: this contained 17 grains, or about two-thirds, of tannic and gallic acids. In order to estimate the comparative value of these galls with those of commerce, 100 grains of best Aleppo galls were submitted to the same treatment with æther and water. The residue weighed 58·50 grains, containing 56 grains of tannic and gallic acids. Of the superiority of the foreign galls there can of course be no doubt; but in comparing the results of these two analyses, it is necessary to observe, that the Aleppo galls operated on were very heavy specimens of the best kind of galls of commerce, and that they had not been perforated by the *Cynips*, while the Devonshire galls had all been perforated, and therefore contained a much smaller proportion of tannin than would have been the case if they had been examined at an earlier period.

If we compare the published analyses of nutgalls, considerable difference will be found in the quantity of tannin obtained by different chemists. The following are the principal:—

| | |
|---------------------------|---------------------------|
| Sir Humphry Davy found .. | 26 per cent. of "tannin." |
| Pelouze | 40 |
| Leconnel | 60 |
| Guibourt | 65 |
| Mohr | 72 |
| Buchner | 77 |

However widely these results may vary, they are entitled to every credit; and high as are those of the two last-mentioned chemists, their well-known accuracy will ensure entire confidence in their statements. I am inclined to think that these great discrepancies are owing to accidental causes, among which the variable nature of the seasons, which influences so much the quantity and intensity of all vegetable secretions, may be a principal one. With the small amount of tannin found in the Devonshire galls I must confess myself much disappointed; but I hope in the ensuing summer to procure some of them at an earlier period, and before they have been perforated by the *Cynips*. I have no doubt that they would then be found to contain enough tannin to justify their being collected for commercial purposes; and if they were gathered at the proper season, before the *Cynips* has escaped, and when the gall is in its most vigorous and valuable state, another good result would follow. The insect would be prevented from increasing to what seems to be a mischievous extent, and a check would be put to the serious injury, if not entire destruction, with which the oak plantations in some of our southern counties appear to be threatened.

Note on *Lepidosiren annectens*, Owen. By EDWARD NEWMAN, Esq., F.L.S.

[Read January 15th, 1856.]

[Abstract.]

REFERRING to Prof. Owen's paper on *Lepidosiren* in the 18th volume of the Society's "Transactions," the author states that the conclusion at which that gentleman has arrived, that the animal in question is a Fish, although controverted by some of our best naturalists, appears to him to receive confirmation from one or two points in its structure on which no great stress has hitherto been laid. The first of these relates to the mode in which the gill is covered, having only a single small external opening, in which respect *Lepidosiren* makes a very near approach to *Muraena*. Secondly, the two peculiar anterior teeth in the upper jaw so closely resemble those of some Fishes, that the vignette representing these teeth in *Echiodon Drummondii*, given in Mr. Yarrell's "History of British Fishes," might serve as well for the front teeth of *Lepidosiren*. Thirdly, the continuous dorsal, caudal and anal fin, and the absence of pectorals and ventrals, are common

characters among *Murænidæ*. And fourthly, the true Fish-scales, together with the lateral line extending from the gill to the extremity of the tail, are characters peculiar to Fishes, and not to be found among Amphibian Reptiles. Assuming then that *Lepidosiren* is unquestionably a Fish, and not either a Reptile or an osculant between Fishes and Reptiles, Mr. Newman regards it as completely obliterating the boundary set up by Cuvier between the two great subclasses of Fishes, the Osseous and the Cartilaginous. In support of this opinion he quotes several passages from Prof. Owen's paper, and concludes by stating his conviction that it is "equally impossible to place it in either the Cartilaginous or Osseous series; and we are compelled either to establish an intermediate series, consisting of but three species or perhaps genera, or to break up those great divisions, which have received the almost universal approbation of naturalists. The first course seems most undesirable in an age in which we are exerting ourselves to find associates and allies for every abnormal form, however apparently isolated. The alternative, the mingling of cartilaginous and osseous fishes, seems inevitable."

Description of a New Species of *Paussus* from Central Western Africa. By J. O. WESTWOOD, Esq., F.L.S. &c.

[Read February 19th, 1856.]

DURING the twenty-six years which have elapsed since the publication of my first Monograph on the family *Paussidæ* in the 16th volume of the "Transactions of the Linnean Society," our knowledge of the species of this singular group has increased in a remarkable manner, as we are now acquainted with nearly a hundred well-defined species. Indeed, even since the appearance of the synopsis of the family which I published in the 19th volume of the "Transactions" in 1841, the number (which then amounted to 47) has been doubled. A considerable number of these new species were described and figured in the 2nd volume of my "Arcana Entomologica" (1845), together with coloured figures of all the previously described species. Seventeen new species were described by me in the "Proceedings" of the Linnean Society, June 19, 1849. A new species from Tangier (subsequently found also in Spain) was described by M. Léon Fairmaire in the "Annales" of the French Entomological Society for 1852. Six additional species with a fresh general synopsis (recording eighty-five species)

were published by me in the "Transactions of the Entomological Society" (vol. ii. p. 84), read August 2nd, 1852, and four additional species were added by me in the "Transactions" of the same Society (vol. iii.), read July 3rd, 1854. I have now the pleasure of adding another new species of the genus *Paussus*, very remarkable in several of its structural details, and which belongs to the African section of the genus with a bipartite prothorax and an excavated clava to the antennæ.

PAUSSUS MURRAII, Westw.

P. prothorace bipartito clavâque antennarum posticè excavatâ; piceo-rufus, sub lente creberrimè punctatus, capite inter oculos transversè elevato et in medio fossulis duabus minimis transversis impresso, angulis posticis parte-que posticâ prothoracis extûs porrectis et ferè latitudine elytrorum, podice setis longis marginato.

Long. corp. 3 lin.

Hab. "Old Calabar," Africæ tropicæ occidentalis. In mus. nostro. Amicissimè communicavit D. Andr. Murray, Entomologus Edinensis peritissimus.

This species is distinguished at once from every species hitherto described in the peculiar form of the clava of the antennæ and prothorax. The upper side of the head is sloping and slightly concave from between the eyes to the fore margin, which is slightly emarginate and a little depressed. Between the eyes the head is raised into a transverse ridge, in the middle of which are two very minute impressions placed transversely with raised black edges: the hinder margin of the eyes is furnished with some porrected bristles: the antennæ have a thick and somewhat prismatical basal joint, and the clava is large, being about equal in size to the prothorax; it is navicular, the front margin or keel being acute, with three deep transverse impressions within the margin. The inner basal edge is very deeply incised close to the insertion of the clava upon the basal joint, the remainder of this margin forming a long and acute angle, the outer edge of which extends to the base of the deep boat-like excavation; the upper edge of this excavation is very slightly crenated; the lower edge on the contrary is more irregular, being deeply emarginate at its base, the emargination clothed with strong bristles, and oblique from the middle to the apex of the antennæ, which is rounded; within the posterior margin the excavation is marked with four deep transverse impressions; the hind part of the head is narrowed into a neck. The prothorax is strongly bipartite; the anterior portion is the shorter, having a sharp ridge running across it, with

each side produced into a strong and acute angle. In the centre of the pronotum is a deep excavation, with a tuft of luteous setæ on each side: the hinder portion has its sides gradually dilated outwards, forming a strong salient tooth or spine on each side, pointing to the outer angle of the shoulder of the elytra; the space between the point of this spine and the outer posterior angles of the prothorax being emarginate, and furnished with a strong tuft of luteous setæ. The elytra are oblong, and with the sides nearly parallel. The disk, and especially the lateral margins, clothed with luteous setæ. The podex is oblique, flat, with the outer margin slightly raised, and fringed with long strong reddish curved bristles. The legs are slender; the tibiæ compressed, but not dilated; the tarsi distinctly 5-jointed, the basal joint being as large as the following.

The species is named in honour of Andrew Murray, Esq., of Edinburgh, whose knowledge of *Coleoptera* is evinced by the excellent Catalogue of the Scottish species recently published by him, as well as by his entomological contribution to the fine volume on the "Natural History of Dee Side" by the late Dr. MacGillivray, recently published by command of Her Majesty, and so liberally distributed by the Prince Consort. Two specimens of the species before us were received by Mr. Murray from Old Calabar, and it is to his liberality that I am indebted for one of them.

On the Influence of the Sexual Organ in Modifying External Character. By WILLIAM YARRELL, Esq., V.P.L.S. &c.

[Read March 18th, 1856.]

HAVING been requested to supply some notes to the Appendix on the subject of Red Deer, published in the handsome volume of the "Natural History of Dee Side and Balmoral," of which I have had the honour to receive a presentation-copy from H.R.H. Prince Albert, I regret that my opportunities of observation on the Red Deer have been so limited; but as the same physiological laws appear to prevail in the three species of Deer which belong to this country, I beg to offer a few remarks on the influence of the sexual organ in modifying external character; the horns in Deer furnishing the most obvious external secondary sexual character in this tribe of animals.

In the volume referred to, it is stated at page 462: "That the production of the horns is dependent upon conditions connected with the sexual function, is proved by the fact, that they are not produced in castrated stags." At page 470 Mr. Robertson states that, "If the operation is imperfectly performed at the time that the stag is void of horns, small horns will grow; but these are never cast, and the velvet which always covers them when they are growing, retains its freshness to the last." Mr. Robertson has the reputation of being good authority, and I have reason to believe that he is correct. When a stag carrying horns is castrated, the operation being perfectly performed, the horns are cast, sometimes as early as the fifth day, and generally within three or four weeks. Very soon after that, the young horns begin to bud and show, whether the stag at the time of castration carried horns or not. The horns increase in size, but are frequently irregular in form, unequal on the two sides, and deficient in bulk and character for the age of the animal. Males in this state are usually called Heavers, or Heaviers, a term apparently intended to have reference to the greater size and weight of body such stags attain; but Pennant in his "British Zoology," under the article on the Goat, says, "that the meat of a castrated goat of six or seven years (which is called Hyfr) is reckoned the best; being generally very sweet and fat. This makes an excellent pasty, goes under the name of rock venison, and is little inferior to that of the deer." The Anglo-Saxon word for a he-goat is Hæfer.

The author of the "Sportsman's Cabinet," published in 1804, states in volume ii. page 61, "that Heaviers are experimentally proved to be of great strength, and afford good sport before hounds, for which reason the Royal hunting establishment of His Majesty George III. was never without a regular succession. The perfect males, after their rutting season, are out of condition for hunting.

"Among the Laplanders the males only of their rein-deer are used as beasts of burden and draught, and chiefly those which are castrated, as they are the strongest."—G. P. Blom's Essay.

To return to the castrated red deer: I remember to have seen a large red stag which had been hunted and caught in one of the outbuildings of a farmer's stack-yard in Berkshire. The horns were unequal in size, both being straight portions of the beam only; one about six inches long, the other about double that length, and both in their velvet. On the beam of greater length

was a rounded bulbous excrescence, upon which blood appeared at the slightest injury.

At the Zoological Gardens some years since, a female rein-deer died while her horns were growing and in the velvet. When the skin had been taken off, I went up to look at the state of the carcase. The shoulders and the whole of the neck were of a bright scarlet colour, from the strong determination of arterial blood to the head at that particular period.

Inequalities in the size and form of the two horns of the same deer may be accounted for, as an injury from a gun-shot wound, or other cause, may affect the horn on one side only by interfering with the natural size or course of the arteries.

When the horns of deer have completed their growth, the blood-vessels are compressed at the burr, and the velvet-like covering then begins to dry up, crack, and peel off; the deer by his fraying assisting to get rid of it.

Colonel Charles Hamilton Smith, in the article on Mammalia in Griffith's "Animal Kingdom," vol. iv. p. 93, says, "Hinds are asserted to have been found with horns, but no well-authenticated fact places this beyond a doubt."

In the Appendix to the "Dee Side Natural History," on the red deer of Scotland, p. 472, it is stated, that in no one instance does it appear that the hind of the red deer was ever observed to have horns. To this, however, there are exceptions, apparently the operation of a physiological law. John Hunter, in his "Observations on Animal Economy," states, that where the male and female among animals are distinguished by a difference in their external characters, by depriving either sex of the influence of the true sexual organ, they will seem to approach each other in outward appearance.

Some years since, a red hind, in the forest of the Duke of Gordon in Scotland, was observed to carry a single horn on one side of her head,—such a horn as the red male bears in his third year. As this appearance was unusual and interesting, a request was made to be allowed to shoot her. Leave was immediately granted, the hind was shot, and on internal examination by two competent persons, she was found to have a scirrhus ovary on the opposite side to that on which she bore the horn. The skull and horn as attached are preserved in the armoury at Gordon Castle, with a label appended detailing the particulars.

About four years ago, a red hind, in the park at Holkham, was observed to carry one horn of some length. She was closely

watched, and having cast this horn at the usual period, it was secured and preserved. I have seen it very recently. It is straight and upright, measuring thirteen inches from the burr to the end; about as thick as a man's fore-finger at its base above the burr, but tapers gradually; brown in colour at the bottom, whiter above, hard, smooth and polished towards the point, which is sharp. To add to the interest in this case, this hind dropped a calf; we may therefore suppose, the cornua and ovaries being double, that one side was healthy and perfect, the other side probably diseased.

About six years since, a red hind in the forest of the Lords of Lovatt was observed to bear a horn, and of this instance I hope to receive further particulars.

The writer in the "Sportsman's Cabinet" before referred to, mentions, at p. 61, that a deer "being deprived of only one testicle, the horn will never regenerate on that side; but continue to grow and be annually shed on the other, where the remaining testicle has not been taken away." This statement of a lateral influence, and the case of the Gordon Forest hind, induced an experiment which I will endeavour to describe. In the autumn of the year 1833, having the advantage of being on the Council of the Zoological Society with Prof. Owen, I suggested to him an experiment having reference to this sexual lateral influence. Mr. Owen very kindly immediately joined me in it. We procured two fallow-bucks, equal in size, and both in their fourth year one, a dark-coloured buck of the breed considered to have been brought originally from the North; the other a buff-coloured one from the South, and both carrying horns of equal size, and of the fourth year.

From one of these fallow-bucks, while held on the ground, Mr. Owen removed the testis of the right side, and from the other buck, the testis on the left side. Neither of these bucks cast either horn, nor was any lateral influence observable. They shed their horns as usual in the following spring, the new horns coming in due course; but in the autumn, when these horns had ceased to grow and become hard, all four horns were those of the third year, and not those of the fifth year: no lateral influence was observable, but it was plainly shown that the diminished sexual power, consequent upon the operation, had produced a corresponding diminution in the size of the horns in both cases. Towards the end of 1834, the Society's farm at Kingston, where the bucks had been kept, was given up, and further observation prevented.

The fallow-buck is at his best in his sixth, or at most in his seventh year; after which, though the carcase may increase, the horns become smaller, and irregularly going back annually through something like their former stages of increase, a very old buck has from the state of his horns been mistaken for a young one. In the osteological department of the Museum at Paris, there was, and may be now, the skeleton of a female rein-deer in which the horns were reduced to little more than a rudiment of the beam and the brow-antler; yet was this animal so old, that the molar teeth were worn down to the edges of the alveolar cavities.

Park-keepers in large establishments, where much venison is required, are in the habit of cutting 20, 30 or 40 bucks in the spring, and giving them the summer run of the park, or better still, in paddocks, while the grass remains nutritious, after which they are taken up for stall-feeding and fattened as wanted. These bucks never lose their velvet. Some park-keepers practise modifications when cutting, producing corresponding differences and effects. If a fawn is castrated at a very early age, and the earlier the better, he will never put forth horns of any sort, but remain a polled buck during life.

The roe is the smallest of our British deer, and being under the influence of the same physiological laws, requires but a brief notice.

The horns acquire but three points each at their best, and as the roe-buck increases in years, his horns, like those of our other deer, diminish in size and number of points, till they recede irregularly to their early appearance in the third or second year.

Roe-deer are preserved in some parks in England, as at Petworth in Sussex, and elsewhere, and form a pleasing addition to the scene. After having fed in the early morning, they, in fine weather, scrape out a bed for themselves in long grass, and when approached jump up in haste, and scud away like a hare from her form.

The males are said to be less friendly disposed towards their young than the males of either of the other two species; but with the very common tendency, not confined to deer, to use power where it is possessed, I suspect this tendency has its origin in the state of the horns.

Roe-bucks shed their horns in December: the new horns, while growing, are covered with their velvet, but become hard and burnished by the end of April. The kids are dropped in May, and may be occasionally exposed to a push of the then hard and pointed horn.

The horns of the red and fallow deer remain in their velvet till August, and while they are in that soft and tender state, the males never make an offensive use of them; and long before they are hard and burnished, the calves of the one, and the fawns of the other, dropped about the first week in June, are strong and nimble enough to get out of harm's way. This, however, is certain, that the old females of all the three species take especial care to conceal their young while they remain helpless.

The neutral effect produced when the animal happens to be deprived of the influence of the true sexual organ, whether from original malformation, subsequent disease, or artificial obliteration, is particularly conspicuous in our common fowls. The capon ceases to crow; the comb and gills do not attain the size of those parts in the perfect male; the spurs appear, but remain short and blunt; and the hackle feathers of the neck and saddle, instead of being long and narrow, are short and broadly webbed. The capon will take to a clutch of chickens, attend them in their search for food, and brood them under his wings when they are tired.

In the imperfect female the comb increases; a short spur or spurs appear; the plumage undergoes an alteration, getting what is usually called "foul-feathered;" she ceases to produce any eggs, and makes an imperfect attempt to imitate the crow of the cock. Being profitless in this state, she is usually made away with. The proverb says,

"A whistling woman and a crowing hen
Are neither good for gods nor men."

Our neighbours and allies the French, who seem to take a wider range in their prejudice against habits which they consider irregular, have the following proverb, which says,

"Poule qui chante, Prêtre qui danse,
Et Femme qui parle latin,
N'arrivent jamais à belle fin."

I have seen two instances in which females of the wild duck have assumed to a considerable extent the appearance of the plumage of the Mallard, even to the curled feathers of the tail. One of these birds, in my own collection, was given me when alive by my kind friend the late John Morgan, Esq. When this bird was examined after death, the sexual organs were found to be diseased, as in the cases of the hen pheasants referred to, and figured in the 2nd volume of the "History of our British Birds." In the published illustrations to his "Fauna of Scandinavia,"

M. Nilsson has given a coloured figure of a duck in this state of plumage, plate 163, which is called a barren female, and in which the curled tail-feathers are made very conspicuous.

From the general similarity in these females to the appearance assumed for a time by healthy males in July, I am disposed to refer this seasonal change in males, in this and in other species of ducks, to a temporary exhausted state of the male generative organs, and their consequent diminished constitutional influence on the plumage.

A male shut up by himself from early spring to the end of July undergoes no change in his plumage; but if he is allowed to associate with females till their season of incubation commences, he then goes through the change, and this appears to indicate the cause of the partial summer moulting.

The appearance is somewhat different, but yet very interesting, in Insects and Crustacea. In these classes the sexual organs are double, and distinct, arranged one on each side of the elongated mesial line. It sometimes happens that a species in which the sexes are of a different colour, or markings, or form, has one sexual organ of each sort, male and female, in which case each half of the same insect is developed under the exclusive influence of the sexual organ on its own side. Instances are preserved among our collections of butterflies, moths, and beetles; and I have seen it twice in the common lobster.

Nor is the human race exempt from the operation of the law which prevails in the Mammalia. In women, at an advanced age, hair appears on the chin and upper lip, and the voice alters, becoming deep in its tone. The beard in old men becomes thin and soft, and our own inimitable Shakspeare has told us,

. . . "his big manly voice,
Turning again toward childish treble, pipes
And whistles in his sound."

Catalogue of the Homopterous Insects collected at Singapore and Malacca by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER, Esq., F.L.S.

[Read May 6th, 1856.]

To carry out the object I had in view, as explained in the note to Mr. Walker's paper on the *Diptera* of Singapore and Malacca,

published in the first number of the "Journal of Proceedings," I have induced the same author to undertake the following Catalogue of Homopterous Insects from the same localities. The specimens were procured during the six months commencing with May and terminating with October, and are all in my collection.

W. WILSON SAUNDERS.

3rd May, 1856.

Ord. **CICADINA**, *Burmeister*.

Fam. **STRIDULANTIA**, *Burm.*

Gen. **PLATYPLEURA**, *Amyot et Serv.*

1. *Platypleura semilucida*, *Walk. Cat. Homopt.* pt. 1. 20. 27.

Inhabits also Java.

Gen. **DUNDUBIA**, *Amyot et Serv.*

2. *Dundubia imperatoria*, *Westw. Arc. Ent.* ii. 13. pl. 51 (Cicada).

Inhabits also Borneo and Sumatra.

3. **DUNDUBIA GUTTIGERA**, n. s. Testacea, capite suprâ vittis tribus angulosis, anticè annulo elliptico lineisque transversis lateralibus nigris, prothorace vittis duabus dorsalibus subparallelis nigris, mesothoracis scutello vittis quinque nigris, abdomine ferrugineo, alis vitreis; anticarum venis marginalibus apice venulisque transversis fusco-maculatis.

Testaceous. Head above with three angular black stripes, and in front with a black elliptical ringlet, which has black transverse lines on each side. Prothorax with two black dorsal nearly parallel stripes. Scutellum of the mesothorax with five black stripes, the inner pair abbreviated, the outer pair interrupted. Drums small, rounded. Abdomen ferruginous. Wings vitreous. Fore wings with a brown spot on each transverse veinlet and on the tip of each marginal vein. Length of the body 11 lines; of the wings 34 lines.

4. **DUNDUBIA ALBIGUTTA**, n. s. Viridis, ex parte testacea, capite suprâ lineis duabus obliquis duabusque lateralibus transversis nigris, anticè lineis nonnullis transversis lateralibus nigris, abdomine subtus tuberculis quatuor nigris, alis vitreis; anticis apice subfuscescentibus, guttâ costali albidâ, venulis transversis lâ et 2â fusco-maculatis.

Green, partly testaceous. Head with two black lines forming an angle in front of the ocelli which are bordered with black; a black line on each side of the fore-border; front with black transverse lines along most of the ridges on each side. Drums small, rounded. Abdomen with two black tubercles on each side beneath. Wings vitreous. Fore wings slightly clouded with brown at the tips; a whitish spot on the costa at the tip of the front areolet; 1st and 2nd transverse veinlets with brown spots. Length of the body 9 lines; of the wings 32 lines.

5. *DUNDUBIA INTEMERATA*, n. s. Testacea, alis vitreis, costâ fulvâ, venis viridibus.

Testaceous. Drums small, triangular. Wings vitreous; costa tawny; veins green; 2nd marginal areolet a little shorter than the 1st; 1st transverse veinlet oblique, hardly curved, parted from the 2nd by full thrice its length; 2nd straight, more oblique and much shorter than the 1st; 3rd nearly straight, longer than the 1st; 4th a little shorter than the 3rd and as long as the 5th, from which it is parted by about thrice its length. Length of the body 10 lines; of the wings 34 lines.

Gen. *CICADA*, *Linn.*

6. *CICADA VIRGUNCTA*, n. s. Viridis, capite parvo, abdominis basi suprâ et segmentorum marginibus posticis luteis, alis vitreis, costâ venisque viridibus.

Green. Head small. Drums very small. Abdomen luteous above at the base; hind borders of the segments luteous. Wings vitreous; costa and veins green; 2nd marginal areolet much shorter than the 1st; 1st transverse veinlet straight, very oblique, parted from the 2nd by about thrice its length; 2nd upright, nearly straight, much shorter than the 1st; 3rd almost straight, as long as the 1st; 4th longer than the 3rd and as long as the 5th, from which it is parted by much less than its length. Length of the body $6\frac{1}{2}$ lines; of the wings 17 lines.

Gen. *HUECHYS*, *Amyot et Serv.*

7. *Huechys sanguinea*, *Deg. Ins.* iii. 221. 18. pl. 33. f. 17 (*Cicada*). Malacca. Inhabits also Java and China.

Fam. *FULGORINA*, *Burm.*

Subfam. *FULGORELLÆ*, *Spinola.*

Trib. *FULGORITES*, *Spinola.*

Subtrib. *FULGOROIDES*, *Spinola.*

Gen. *HOTINUS*, *Amyot et Serv.*

8. *Hotinus subocellatus*, *Guérin*; *Delessert, Souvenirs Voy. Inde*, 66. pl. 16. f. 1; *Rev. Zool.* 1839 (*Fulgora*).

Malacca. Inhabits also Nepaul.

Subtrib. *LYSTROIDES*, *Spinola.*

Gen. *APHÆNA*, *Guérin.*

9. *Aphæna rosca*, *Guérin, Voy. Belanger, Zool.* 454. pl. 3. f. 3.

Malacca. Inhabits also Sumatra.

10. *Aphæna Saundersii*, *White, Ann. Nat. Hist.* 1846, xvii. 330.

Malacca. Inhabits also Hindostan and Borneo.

Subtrib. *DICTYOPHOROIDES*, *Spinola.*

Gen. *DICTYOPHORA*, *German.*

11. *Dictyophora speilinea*, n. s. Viridis, capite lanceolato prasino carinis tribus suprâ unâque subtus luteis, prothorace carinis tribus prasinis dua-

busque luteis, mesothorace carinis tribus lateribusque ex parte prasinis, tibiis anticis tarsisque anterioribus fulvis, alis limpidis, venis stigmatumque viridibus.

Green. Head emerald-green, with three luteous ridges above and one beneath; protuberance lanceolate, ascending, as long as the hind part of the head. Prothorax with three emerald-green ridges, the lateral pair marginal and accompanied by two luteous ridges. Mesothorax with three emerald-green ridges; sides partly emerald-green. Fore tibiae and anterior tarsi tawny. Wings limpid; veins and stigma green, the latter occupying three areolets. Length of the body 5 lines; of the wings 14 lines.

Singapore.

Gen. CROMNA, n. g.

Dictyophora affinis. Caput suprâ conicum, subascendens; frons lanceolata, subcarinata, marginibus vix elevatis. Antennæ breves; articulus 1^{us} 2^o multò brevior. Thorax subcarinatus. Prothorax subarcuatus. Pedes breves. Alæ latæ; anticæ areolis costalibus et marginalibus ordinariis areolisque plurimis minutis discalibus abnormibus, costâ subconvexâ, margine exteriore subquadrato, angulo interiore peracuto.

Allied to *Dictyophora*. Head conical above, very slightly ascending; front lanceolate, indistinctly keeled, with the margins hardly elevated. Antennæ short; 2nd joint very much shorter than the 1st. Thorax with a slight keel. Prothorax somewhat arched. Legs short. Wings broad. Fore wings with regular areolets along the costa and along the exterior border, and with very numerous minute irregular areolets over the rest of the surface; costa slightly convex, forming a slightly obtuse angle at the tip; exterior border straight, subquadrate; interior angle very acute.

12. CROMNA ACUTIPENNIS, n. s. Viridis, subtùs pallidior, capite thoraceque testaceo-vittatis, alis anticis lineâ marginali fuscâ, posticis albis.

Green, paler beneath. Head and thorax with testaceous stripes. Fore wings with a brown line extending from near the tip of the costa to one-third of the length of the hind border from the interior angle. Hind wings white. Length of the body 3½ lines; of the wings 10 lines.

Malacca.

Gen. DARADAX, n. g.

Caput lanceolatum, ascendens, lateribus elevatis; frons lanceolata, carinata. Antennæ globosæ, minimæ. Prothorax valdè arcuatus, carinatus. Mesothorax quadricarinatus. Alæ anticæ fusiformes, areolis costalibus et marginalibus plurimis ordinariis, discalibus longis.

Head lanceolate, ascending, with a ridge along each side; front lanceolate, with a middle keel; sides also ridged. Antennæ globose, very minute; bristle moderately long, very slender. Prothorax much arched, with a slight middle keel; each side forming a fusiform compartment. Mesothorax with four keels. Fore wings fusiform, with numerous parallel equidistant veinlets along the costa; discal areolets long; marginal areolets short, like those of the costa.

13. *DARADAX FUSIPENNIS*, n. s. Viridis, ex parte lutescens, alis anticis fusco apud marginem exteriorem guttatis, posticis albis.

Green, partly lutescent. Fore wings with brown dots along the exterior border. Hind wings white. Length of the body 3 lines; of the wings 7 lines.

Malacca.

Gen. *ELICA*, n. g.

Caput conicum, subascendens, suprâ tricarinatum; frons lanceolata, tetragona, tricarinata, lateribus elevatis. *Antennæ* breves. *Prothorax* brevissimus. *Mesothorax* tricarinatus. *Alæ* anticæ latæ, venulis plurimis transversis costalibus, areolis discalibus basalibus elongatis, exterioribus abbreviatis sæpissimè hexagonis.

Head conical, slightly ascending, with three ridges above; front lanceolate, tetragonal, with three ridges, the lateral pair curved, margins also ridged. *Antennæ* conical; bristle about twice the length of the preceding part. *Prothorax* very short. *Mesothorax* with three keels. Fore wings broad, with numerous transverse veinlets along the costa; discal areolets elongate towards the base of the wing; those exterior more numerous, short, and generally hexagonal or pentagonal.

14. *ELICA LATIPENNIS*, n. s. Testacea, ex parte fulva, capite suprâ thoracisque disco fuscis, alis hyalinis subtestaceis, venis fulvis, nonnullis nigris.

Testaceous, partly tawny. Head above and disk of the thorax brown. Wings hyaline, with a slight testaceous tinge; veins tawny, some of them black, forming an irregular incomplete band. Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines.

Malacca.

Gen. *ELIDIPTERA*, *Spinola*.

15. *ELIDIPTERA SMARAGDILINEA*, n. s. Ferruginea, capite ex parte prasino, cornu gracili cylindrico ascendente nigro subtùs viridi, fronte angustâ, facie pectoreque nigro alboque variis, prothoracæ maculis tribus prasinis, mesothoracæ vittâ prasinâ, abdomine vittis duabus prasinis duabusque ventralibus nigris, pedibus viridi-fulvis, femoribus basi nigris, tibiis anticis apice albis, alis hyalinis vittis duabus strigâque transversâ fuscis.

Ferruginous. Head emerald-green about the eyes and on each side of the front; protuberance slender, cylindrical, ascending, black above, green beneath, about twice the length of the head above; front long and narrow; face black and white. *Prothorax* with an emerald-green spot in the middle and one on each side. *Mesothorax* with an emerald-green stripe. *Pectus* black and white. *Abdomen* with a green stripe on each side, and with a black stripe on each side beneath. Legs tawny; femora black at the base; tibiæ and tarsi partly green; fore tibiæ white towards the tips. Wings limpid. Fore wings with a narrow brown stripe along the terminal part of the costa, and with a broad brown stripe along the corresponding part of the hind border, the two stripes connected by a brown streak along the transverse veinlets. Length of the body $4\frac{1}{2}$ lines; of the wings 11 lines.

Mount Ophir.

Subtrib. CIXIOIDES, *Spinola*.Gen. CEXIUS, *Latr.*

16. CIXIUS PUSTULATUS, n. s. Fulvus, subtùs testaceus, capite viridescente, guttis duabus nigris, carinis ferrugineis, alis anticis maculis pallidioribus necnon punctis plurimis guttisque paucis nigricantibus, posticis fuscis.

Tawny, testaceous beneath. Head greenish, with a black dot on each side; ridges ferruginous. Fore wings with some paler marks and with many minute blackish dots which are accompanied by two or three larger and darker dots. Hind wings brown. Length of the body 3 lines; of the wings 7 lines.

In this species the veinlets towards the tip of the costa and along the apical margin are more numerous than in the European *Cixii*.

Singapore.

17. CIXIUS ALBISTRIGA, n. s. Nigricans, subtùs testaceus, capite parvo, fronte angustâ fuscâ, segmentorum abdominalium marginibus posticis rufescentibus subtùs albidis, alis anticis fuscis, strigis tribus transversis costalibus subapicalibus albidis, posticis cinereis.

Blackish, testaceous beneath. Head much smaller, and with the front much narrower than in the European species; front dark brown. Hind borders of the abdominal segments reddish above, whitish beneath. Fore wings brown, with three whitish transverse streaks towards the tip of the costa. Hind wings grey. Length of the body 2 lines; of the wings 5 lines.

Singapore.

18. CIXIUS EFFERATUS, n. s. Testaceus, fronte subfusiformi, oculis magnis approximatis, abdomine fulvo, alis limpidis, venis fulvis, anticis stigmatè testaceo maculisque duabus marginalibus fuscis, posticis strigâ costali apicali fuscâ.

Testaceous. Front subfusiform, attenuated in front. Eyes large, nearly contiguous on the vertex. Abdomen tawny. Wings limpid; veins tawny; stigma testaceous, with a brown spot contiguous to its tip, and opposite a smaller and paler brown spot on the interior border. Hind wings with a brown streak at the tip of the costa. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

Singapore.

Gen. EURIA, n. g.

Caput brevissimum, suprâ arcuatum; frons longa, subfusiformis, carinata. *Antennæ* globosæ. *Thorax* brevissimus, carinatus, lateribus elevatis. *Alæ* anticæ mediocriter latæ, venis costalibus plurimis ordinariis, marginalibus multis sæpissimè furcatis, discalibus nonnullis, basalibus paucis.

Head very short, arched above. Front long, subfusiform, with a keel in the middle. *Antennæ* small, globose. *Thorax* very short, with a keel in the middle and a ridge on each side. Fore wings moderately broad, with the angles rounded; many oblique, parallel, equidistant veins along the costa; veins along the exterior border very numerous, mostly forked, divided by transverse veinlets from the much fewer veins in the next compartment, which is likewise divided by veinlets from the still fewer basal areolets.

19. *EURIA LURIDA*, n. s. Fuscescens, subtùs pallidior, capite viridi carinis fulvis, alis anticis fusco-quadrifasciatis, posticis fusco-trifasciatis.

Brownish, paler beneath. Head green, with tawny ridges. Wings lurid. Fore wings with four brown bands; 1st and 2nd dilated in front; 3rd slender, curved, joined at each end to the 2nd; 4th marginal. Hind wings with three brown bands. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Singapore.

Gen. *BIDIS*, n. g.

Caput conicum, vix ascendens, vertice carinato, fronte perangustâ carinatâ lateribus elevatis. *Antennæ* filiformes; articulus 2^{us} 1^o paullo longior; setâ longissimâ. *Prothorax* arcuatus, brevissimus. *Mesothorax* tricarinatus. *Ala* anticæ sat angustæ, areolis nonnullis apud costæ apicem et apud marginem exteriorem; areolæ basales longissimæ, discales elongatæ.

Head conical, hardly ascending, with a ridge above; front very long and narrow, with a middle keel; sides also ridged. *Antennæ* filiform; 2nd joint a little longer than the 1st; bristle about twice the length of the 2nd, and full $\frac{3}{4}$ ths of the length of the body. *Prothorax* arched, very short. *Mesothorax* with three keels. Fore wings rather narrow, with marginal areolets towards the tip of the costa and along the exterior border; discal areolets elongated, less than half the length of the basal areolets.

20. *BIDIS NOTIVENA*, n. s., mas et fœm. Testacea, ex parte viridis, alis hyalinis, anticis subtestaceis, venis testaceis ex parte nigricantibus. Mas ex parte rufescens.

Male and female. Testaceous, partly green. Wings hyaline. Fore wings with a very slight testaceous tinge; veins testaceous, here and there blackish.

Male. Partly red. Length of the body 2 lines; of the wings 6 lines.

Singapore and Malacca.

Trib. *ISSITES*, *Spinola*.

Gen. *EURYBRACHYS*, *Guérin*.

21. *EURYBRACHYS MULTICOLOR*, n. s. Lætè viridis, albo-tomentosa, thorace testaceo, abdominis lateribus posticis lætè rufis, membranis duabus apicalibus foliaceis fulvis, alis anticis nigro-guttatis, apud costam nigro-strigatis, marginibus latis subhyalinis, posticis albis, maculis nonnullis marginalibus nigris.

Bright green, with white tomentum. Thorax mostly testaceous. Abdomen bright red on each side towards the tip, which has two foliaceous tawny appendages. Fore wings nearly hyaline, with green disks, which are brightest beneath, and with several black discal dots; some little black streaks along the costa. Hind wings white, with some black marginal spots. Length of the body 7 lines; of the wings 22 lines.

22. *EURYBRACHYS RUBRESCENS*, n. s. Testacea, vertice thoraceque rufescente notatis, fronte viridi-testaceâ, pedibus roseis, alis anticis pubescentibus, basi purpureo-rufis nigro-guttatis, apices versus fulvis, fasciâ intermediâ marginibusque ex maximâ parte sordidè hyalinis, tuberculis duobus submarginalibus nigro-uniguttatis, posticis lacteo-albis fasciâ fuscâ.

Testaceous. Head, vertex and thorax with reddish marks. Front greenish testaceous. Legs rosy red. Fore wings pubescent, slightly tuberculated, and with a black shining dot near the tip of the costa and at three-quarters of the length of the hind border, purplish red and with black dots towards the base, tawny towards the tips, with a dingy hyaline middle band and with the borders chiefly of the same hue. Hind wings milky white, with a brown band. Length of the body 5 lines; of the wings 18 lines.

Mount Ophir.

Subtrib. FLATOÏDES, *Spinola*.

Gen. FLATOÏDES, *Guérin*.

23. *Flatoïdes tenebrosus*, *Walk. Cat. Homopt.* pt. 2. 406. 7.

Malacca and Singapore. Inhabits also China.

24. *Flatoïdes marginalis*, *Walk. Cat. Homopt.* pt. 2. 409. 10.

Mount Ophir. Inhabits also Africa?

25. FLATOÏDES DISCALIS, n. s. Nigra, fronte tricarinatâ marginibus subelevatis, segmentorum abdominalium marginibus posticis pedibusque testaceis, alis anticis nigricantibus disco guttisque quatuor limpidis, punctis marginalibus testaceis, posticis limpidis fusco-marginatis.

Black. Front much broader than long, with a slightly elevated margin, and with three slight keels. Hind borders of the abdominal segments and legs dull testaceous. Fore wings blackish, with a testaceous point on the tip of each vein; disk limpid; two limpid dots on the costa, and two towards the tip of the exterior border. Hind wings limpid with brown borders. Length of the body 3 lines; of the wings 8 lines.

Singapore.

26. FLATOÏDES EMARGINATUS, n. s. Nigricans, capite pectore pedibusque testaceis, fronte carinis tribus abbreviatis, alis nigricantibus, anticis maculâ costali albo-limpidâ, incisuris duabus costalibus exterioribus, margine exteriore anticè concavo posticè dilatato.

Blackish. Head, pectus and legs dull dark testaceous; front about twice broader than long, with an elevated border, and with three short keels on the hind part. Wings blackish. Fore-wings slightly hooked; costa with two slight excavations between the tip and a white limpid spot which is beyond the middle; exterior border concave between the tip, and a conical dilatation which is in front of the middle. Hind wings slightly excavated along the exterior half of the costa. Length of the body 3 lines; of the wings 11 lines.

Singapore.

Gen. RICANIA, *Germar*.

27. *Ricania Hemerobii*, *Walk. Cat. Homopt.* pt. 2. 425. 19.

Malacca. Inhabits also Ceylon.

Gen. CONNA, n. g.

Corpus sublineare. *Caput* thorace vix angustius, fronte depressâ, elongatâ, carinulâ mediâ, lateribus subelevatis. *Prothorax* arcuatus, carinatus, ver-

ticem posticum superans. *Mesothorax* tricarinatus. *Pedes* breviusculi, sat validi. *Alæ* latæ, apice rotundatæ; anticæ areolis costalibus ordinariis, discalibus plurimis abnormibus.

Body almost linear. Head nearly as broad as the thorax; vertex much longer than broad; front flat, much longer than broad, forming a rounded angle on the middle of each side, with the borders slightly elevated and with a slight middle keel. Antennæ short; 2nd joint much shorter than the 1st; bristle not long. Prothorax keeled, arched, extending over the hind part of the vertex. Mesothorax longer than broad, with three keels. Legs rather short and stout. Wings broad, rounded at the tips. Fore wings with a row of regular areolets along the costa; discal areolets numerous, very irregular in size and shape.

28. CONNA GUTTIFERA, n. s. Testacea, capite guttis sex nigris, verticis thoracisque discis fusciscentibus, abdominis vittâ dorsali fuscâ, segmentorum marginibus posticis albidis, alis hyalinis, anticis subtestaceis guttis paucis fusciscentibus, posticarum margine ex parte fusciscente.

Testaceous. Vertex and thorax with brownish disks. Head with two black dots on each side, and four in front. Abdomen with a brown dorsal stripe; hind borders of the segments whitish. Wings hyaline. Fore wings somewhat testaceous, with a few slight brownish dots. Hind wings with a brownish tinge along part of the hind border.

Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines.

Malacca.

Gen. BENNA, n. g.

Corpus sat gracile. *Caput* carinatum, thorace paullo angustius, lateribus elevatis, fronte compressâ elongato-subfusiformi. *Antennæ* breviusculæ. *Thorax* tricarinatus. *Prothorax* brevissimus. *Abdomen* basi halteribus duobus capitatis, oviductu longo arcuato. *Pedes* longiusculi, sat graciles. *Alæ* latæ, apice rotundatæ; anticæ areolis discalibus brevioribus, basalibus et marginalibus longioribus.

Body rather slender. Head a little narrower than the thorax, with a keel which extends from the back of the vertex to the rostrum; sides also ridged; front compressed, elongate-subfusiform. First and 2nd joints of the antennæ a little shorter together than the breadth of the front; bristle not long. Thorax with three ridges. Prothorax very short. Abdomen at the base with two lateral capitate appendages like the halteres of *Diptera*; tip terminating in a long curved oviduct. Legs rather long and slender. Wings broad, rounded at the tips. Fore wings with about twenty areolets, formed by two irregular bands of transverse veinlets; the discal areolets generally shorter than the basal and the marginal areolets.

29. BENNA CAPITULATA, fœm. Testacea, abdomine lanuginoso, alis hyalinis, anticis subtestaceis, guttâ discali nigrâ guttulisque duabus fuscis, venis fuscis, basi et apud costam testaceis, venulis transversis ex parte infuscatis, strigâ apud marginem exteriorem fuscâ, stigmate testaceo.

Female. Testaceous. Abdomen with long cottony secretions; capitate appendages with white tips. Wings hyaline. Fore wings with a very slight testaceous tinge; veins brown, testaceous towards the base and in front, with a

black basal dot, and with two smaller brown dots near the base; transverse veinlets partly clouded with brown; a brown streak along the exterior border; stigma testaceous. Length of the body 3 lines; of the wings 8 lines.

Singapore.

Gen. *POCHAZIA*, *Amyot et Serv.*

30. *Pochazia fasciata*, *Fabr. Syst. Rhyn.* 47. 8. (Flata.)

Singapore. Inhabits also Java.

31. *Pochazia fumata*, *Amyot et Serv. Hist. Nat. Hém.* 529. 2. *Flata fuscata*?
Fabr. Syst. Rhyn. 47. 9.

Malacca and Singapore. Inhabits also Java.

32. *Pochazia obscura*, *Fabr. Syst. Rhyn.* 49. 16. (Flata.)

Malacca. Inhabits also Hindostan.

33. *POCHAZIA INTERRUPTA*, n. s. Testacea, fronte elongato-subquadrata, prothorace arcuato verticem ex parte superante, mesothorace tricarinato, alis fuscis, anticis apud marginem posticum ex parte luridis, fasciâ interruptâ fuscâ, apice testaceo-hyalino.

Testaceous; vertex much broader than long; front elongate-subquadrate, with a slight groove in the middle. Prothorax arched, extending over part of the vertex. Mesothorax with three slight keels. Wings brown. Fore wings partly lurid towards the hind border; an interrupted band beyond the middle; the tips hyaline, slightly testaceous. Length of the body 3 lines; of the wings 7 lines.

Singapore.

34. *POCHAZIA COSTIMACULA*, n. s. Nigra, capite pedibusque fulvis, vertice fusco margine fulvo, alis nigricantibus, anticis apud margines et apud venulas transversas luridis, maculâ costali albido-hyalinâ.

Black. Head and legs tawny; vertex brown, with a tawny border; front broader than long, with a middle keel and with an elevated margin. Wings blackish. Fore wings mostly lurid along the borders and about the transverse veinlets, and with a whitish hyaline spot on the costa beyond the middle. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Malacca.

35. *POCHAZIA GRADIENS*, n. s. Fulva, subtus testacea, alis nigris, anticis apud costam fulvis.

Tawny, testaceous beneath. Head with a middle keel, and with the margins elevated. Front hardly broader than long; sides rounded. Wings blackish. Fore wings tawny along the costa. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

Singapore.

Gen. *NEPHESA*, *Amyot et Serv.*

36. *Nephesa rosea*, *Spinola, Ann. Soc. Ent. France*, viii. 400. 5. (Ricania.)

Flata matutina, *Walk. Cat. Homopt.* 437. 13.

Singapore. Inhabits also Java.

Gen. FLATA, *Fabr.*37. *Flata obscura*, *Fabr. Syst. Rhyn.* 49. 16.

Singapore. Inhabits also Hindostan.

Gen. COLOBESTHES, *Amyot et Serv.*38. *COLOBESTHES ALBIPLANA*, n. s. Alba, alis anticis apud costam convexis, margine exteriore quadrato, angulo interiore attenuato peracuto, posticis vix acuminatis.

White. Fore wings convex in front, rectangular at the tips, straight and quadrate from thence to the interior angle which is attenuated and very acute; hind border straight. Hind wings hardly acuminate at the tips.

Length of the body 5 lines; of the wings 22 lines.

Singapore.

39. *COLOBESTHES MARGINATA*, n. s. Viridi-alba, mesothorace vittis duabus testaceis luteo-unilineatis, alis anticis fasciâ marginali luteâ, basi subtuberculatis, apud costam convexis, margine exteriore quadrato, angulo interiore attenuato acuto.Greenish white. Front not broader than long, with a slightly elevated border and a slight keel; sides slightly rounded. Mesothorax on each side with a testaceous stripe which includes a luteous line. Fore wings minutely tuberculate towards the base, convex in front, rectangular at the tips, straight and quadrate from thence to the hind angle which is attenuated and acute; hind border straight; a pale luteous marginal band extending from $\frac{3}{4}$ ths of the length of the costa nearly to the middle of the hind border.

Length of the body 4 lines; of the wings 18 lines.

Malacca.

Gen. PÆCIOPTERA, *Latr.*40. *Pæcioptera maculata*, *Guér. Icon. Règne Anim. Ins.* pl. 58. f. 7.

Malacca and Singapore. Inhabits also Java.

41. *PÆCIOPTERA LUTEIMARGO*, n. s. Subtestaceo-viridis, fronte subcarinata, lateribus subelevatis rotundatis, prothorace arcuato verticem ex parte superante, alis anticis margine exteriore subquadrato, fasciâ apicali luteâ fusco-marginatâ, posticis limpidis.

Green, with a slight testaceous tinge. Front a little longer than broad, with the border slightly elevated, and with a slight keel; sides rounded. Thorax not keeled. Prothorax nearly semicircular, extending over the vertex. Mesothorax broader than long. Fore wings subquadrate at the tips, about which there is a luteous brown-bordered band. Hind wings limpid.

Length of the body 3 lines; of the wings 7 lines.

Singapore.

42. *PÆCIOPTERA NIVEINA*, n. s. Alba, *P. luteimarginis* structurâ, alis anticis fasciâ marginali testaceâ.White, in structure like *P. luteimargo*. Fore wings with a testaceous marginal band which extends from two-thirds of the length of the costa to the base of the hind border. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Mount Ophir.

Gen. EUPILIS, n. g.

Fœm. *Corpus* subfusiforme. *Caput* breve, anticè rotundatum, thorace angustius; vertex depressus, bicarinatus; frons convexa, lævis; facies lanceolata, vix carinata. *Antennæ* globosæ. *Oviductus* longus, arcuatus, lanceolatus. *Alæ* sat angustæ; anticæ apice rotundatæ, venulis quatuor transversis costalibus, venulisque quatuor discalibus.

Female. Body subfusiform. Head nearly semicircular, narrower than the thorax; vertex depressed, with a ridge on each side; front convex, smooth; face lanceolate, hardly keeled. *Antennæ* globose. Abdomen terminating in a long curved lanceolate oviduct. Wings rather narrow. Fore wings rounded at the tips, with four transverse veinlets along the costa, and with four irregular discal transverse veinlets.

43. *EUPILIS ALBILINEOLA*, n. s., fœm. Testacea, ex parte viridis, fronte nigrâ, maculâ fulvâ margineque testaceo, facie fasciis duabus (antere maculari) nigris, thorace pectoreque nigro-maculatis, abdomine fasciis nigris, alis hyalinis, venis nigris, anticis subluridis fusco quinque-strigatis, venulis transversis albidis.

Female. Testaceous, partly pale green. Front black, shining, with a tawny central spot and with a testaceous border; face with two black bands, the anterior one macular. Thorax and pectus with black spots. Abdomen with black bands. Wings hyaline, with black veins. Fore wings slightly lurid, with five brown streaks; transverse veinlets white. Length of the body 4 lines; of the wings 7 lines.

Singapore.

Fam. MEMBRACINA, *Burmeister*.Gen. CENTROTUS, *Fabr.*

44. *Centrotus Taurus*, *Fabr. Syst. Rhyn.* 20. 19.

Mount Ophir and Singapore. Inhabits also Hindostan, Java, the Philippine Isles, and China.

45. *CENTROTUS LAMINIFER*, n. s. Nigricans, scabrosus, thoracis cornubus anticis divergentibus subplanis membranaceis rufo-fuscis, postico abdomen superante, pedibus ferrugineis, alis luridis, anticis apud costam nigricantibus.

Blackish, scabrous. Thorax armed in front with two almost directly diverging nearly horizontal membranous reddish-brown horns, from each of which a keel proceeds to the tip of the hind horn, which is horizontal and extends beyond the abdomen. Legs ferruginous. Wings lurid. Fore wings blackish along the costa. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

Singapore.

46. *CENTROTUS CALIGINOSUS*, n. s. Niger, obscurus, brevis, robustus, densè et scitè scaber, thoracis cornubus lateralibus validis abbreviatis divergentibus obliquè ascendentibus, cornu postico abdominis dimidium non superante, alis anticis fuscis, basi nigris, posticis limpidis.

Black, stout, short, dull, thickly and minutely scabrous. Lateral horns of

the thorax stout, diverging, obliquely ascending, shorter than the breadth of the thorax between them; hind horn horizontal, extending to half the length of the abdomen. Tarsi ferruginous. Fore wings brown, black at the base. Hind wings limpid. Length of the body 2 lines; of the wings 4 lines.

Malacca.

47. *CENTROTUS SEMIVITREUS*, n. s. Niger, crassus, brevis, nitens, subtilissimè punctatus, thorace anticè inermi angulato, cornu postico abdomen ferè adæquante, alis hyalinis, anticearum dimidio apicali nigro.

Black, thick, short, shining, very minutely punctured. Thorax unarmed in front, but angular on each side by the base of the fore wing; hind horn horizontal, extending nearly to the tip of the abdomen. Wings hyaline. Fore wings black for half the length from the tips. Length of the body $1\frac{1}{2}$ line; of the wings $3\frac{1}{2}$ lines.

Singapore.

48. *CENTROTUS SEMIFASCIA*, n. s. Niger, obscurus, thorace anticè inermi, cornu postico abdominis dimidium superante; alis hyalinis, anticis guttâ costali fasciâ subapicali apiceque fuscis.

Black, dull. Thorax unarmed in front; hind horn horizontal, extending to rather beyond half the length of the abdomen. Wings hyaline. Fore wings with a brown dot in front, a subapical band, and brown tips. Length of the body 1 line; of the wings $2\frac{1}{2}$ lines.

Malacca.

Gen. MICREUNE, n. g.

Centoto affinis. Thorax anticè lanceolatus; cornu caput longè superans, apud apicem ramis duabus erectis subarcuatis armatum; cornu posticum abdominis dimidio vix brevius.

Allied to *Centrotus*. Thorax prolonged into a long, slender, lanceolate horn which extends far beyond the head, and has at its tip two more slender vertical slightly recurved and diverging branches. Hind part of the thorax armed with a horizontal horn which extends to near half the length of the abdomen. Wings fusiform, much like those of *Centrotus*.

49. *MICREUNE FORMIDANDA*, n. s. Nigra, thorace scabro, cornubus carinatis, segmentorum abdominalium marginibus posticis genubus tarsisque fulvis, alis anticis nigricantibus, posticis cinereis.

Black. Thorax scabrous; its horns channelled. Hind borders of the abdominal segments, knees and tarsi tawny. Fore wings blackish. Hind wings grey. Length of the body lines; of the wings lines.

Singapore.

Fam. CICADELLINA, Burmeister.

Trib. LÆVIPEDES, Amyot et Serv.

Subtrib. CERCOPIDES, St. Farg. et Serv.

Gen. CERCOPIS, Fabr.

50. *Cercopis tricolor*, St. Farg. et Serv. Enc. Méth. x. 604. 1.

Var. Alis anticis nigris guttis sex basalibus rufis.

Var. Black, shining. Head, thorax, scutellum towards the tip, hind borders of the abdominal segments, and tip of the abdomen, red, as are also the legs. Femora black, the four anterior red towards the tips. Fore wings with six red dots on each at the base.

Mount Ophir. Inhabits also Java.

51. *Cercopis plana*, *Walk. Cat. Homopt.* pt. 3. 653. 10.

Var. Thorax nigro-bipunctatus.

Var. Scutum of the mesothorax with two black points.

Mount Ophir. Inhabits also Java.

52. *Cercopis dorsimacula*, *Walk. Cat. Homopt.* pt. 2. 658. 31.

Malacca. Inhabits also North Bengal.

53. *Cercopis costalis*, *Walk. Cat. Homopt.* pt. 2. 664. 45.

Var. Alæ anticæ guttis duabus subapicalibus rufis.

Var. Fore wings with two red subapical dots.

Inhabits also Malabar.

54. *CERCOPIS RUGULOSA*, n. s. Nigra, nitens, subtùs ferruginea, abdominis marginibus pedibusque rufis, femoribus vittâ nigricante, alis anticis rugulosis.

Black, shining, ferruginous beneath. Abdomen bordered with red. Legs red; a blackish band on each of the femora. Fore wings rugulose. Length of the body 5 lines; of the wings 14 lines.

Mount Ophir.

Nearly allied to *C. viridicans*, Guér., but without any tinge of green.

55. *CERCOPIS DISLOCATA*, n. s. Nigra, capite fasciâ verticis marginibusque anticis testaceis, thorace testaceo maculis duabus anticis nigris, alis anticis costâ testaceâ, fasciis duabus vittâque obliquâ dislocatâ rufis.

Black. Head testaceous, black across the vertex and on each side in front. Thorax testaceous, with a black spot on each side in front. Fore wings testaceous along the costa, with two red bands, and with a red oblique stripe which extends from near the base of the wing to the hind end of the 2nd band, and is dislocated as it traverses the 1st band. Length of the body 6 lines; of the wings 14 lines.

Singapore.

56. *CERCOPIS UNIFASCIA*, n. s. Rufa, thoracis lateribus dilatatis, pectoris disco nigro, alis anticis fasciâ nigrâ, posticis hyalinis.

Red. Thorax dilated on each side. Disk of the pectus black. Fore wings with a black band across the middle. Hind wings hyaline. Length of the body 6 lines; of the wings 12 lines.

Singapore.

57. *CERCOPIS DISCREPANS*, n. s. Nigro-purpurea, subtùs nigra, alis anticis nigris maculâ elongatâ nonnunquam divisâ rufâ.

Blackish-purple, black beneath. Fore wings black, with an elongated red spot, which is contracted in the middle, and occasionally divided. Length of the body 3-3½ lines; of the wings 8-9 lines.

Singapore.

Gen. COLSA.

Corpus subfusiforme. *Caput* sat magnum, thorace paullo angustius; vertex depressus; frons convexa; facies brevi-conica, lateribus impressis. *Antennæ* brevissimæ; seta brevis. *Prothorax* brevis, anticè angustior. *Mesothorax* subpunctatus; scutellum excavatum. *Alæ* angustæ, apice rotundatæ, antiçæ venulis nonnullis costalibus apicalibus venisque quatuor longitudinalibus, 1^a 2^aque furcatis.

Body subfusiform, shining. Head rather large, a little narrower than the thorax; vertex somewhat depressed; front convex; face short-conical, impressed on each side. Antennæ very short; bristle shorter than the breadth of the head. Prothorax narrower in front, about six times broader than long. Mesothorax minutely punctured; scutellum with a fusiform depression. Wings narrow, rounded at the tips. Fore wings with four longitudinal veins; 1st springing from the middle of the costa, emitting a fork towards the tip of the costa, and ending at somewhat behind the tip of the wing; 2nd forked near the base, springing from near the base of the costa; the forks connected by a veinlet at half their length; the fore fork emitting a branch to the 1st vein; 3rd slender, springing from near the base of the costa, ending on the hind border with a veinlet which connects it with the hind fork of the 2nd vein; 4th springing from very near the base of the costa, and extending obliquely to the hind border; several oblique veinlets at the tip of the costa.

58. COLSA COSTESTRIGA, n. s. Nigra, subtùs testacea, prothorace scutelloque testaceis, abdomine testaceo fasciâ nigrâ, coxis femoribusque testaceis, alis limpidis, venis nigris crassis, costâ nigrâ, stigmate albido-testaceo.

Black, testaceous beneath. Prothorax and scutellum testaceous. Abdomen testaceous, with a black band. Legs black; coxæ and femora testaceous. Wings limpid; veins black, thick; costa black; stigma whitish testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings $6\frac{1}{2}$ lines.

Malacca.

Subtrib. APHROPHORIDES, *Amyot et Serv.*Gen. PTYELUS, *St. Farg. et Serv.*

59. PTYELUS BIPARS, n. s. Testaceus, capite suprâ thoraceque testaceis, pectore testaceo-bivittato, alis anticis vittâ brevi posticâ fasciâque testaceis, posticis fusciscentibus.

Black. Head above and thorax testaceous. Pectus with a testaceous stripe along each side. Fore wings with a testaceous stripe which extends along half the length of the hind border from the base, and is united to a testaceous band across the middle. Hind wings brownish. Length of the body 4 lines; of the wings 9 lines.

Singapore.

60. PTYELUS IMMUTATUS, n. s. Testaceus, capite subtùs nigricante, pectore ex parte abdomineque nigris, tibiis apice nigris, alis anticis subpubescentibus, posticis cinerascentibus.

Testaceous. Head blackish beneath and with the usual ridges. Pectus partly black. Abdomen black. Tibiæ black at the tips. Fore wings minutely

pubescent. Hind wings greyish. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Singapore.

Subtrib. SERRIPEDES, *Amyot et Serv.*

Coh. TETTIGONIDES, *Amyot et Serv.*

Gen. TETTIGONIA, *Germar.*

61. *Tettigonia farinosa*, *Fabr. Syst. Rhyn.* 70. 41. *T. brevifrons*, *Walk. Cat. Homopt.* 754. 41.—*T. nigrifrons*, *Signoret, Ann. Soc. Ent. Fr.* 3^{me} sér. i. 671. 123. pl. 21. f. 14.

Malacca and Singapore. Inhabits also Java, Pulo-Pinang, and Sumatra.

M. Signoret apparently describes the male of this species as *T. farinosa*, and the female as *T. nigrifrons*.

62. *Tettigonia ferruginea*, *Fabr. Syst. Rhyn.* 69. 36. (Cicada.)

Singapore. Inhabits also Hindostan, Java, the Philippine Isles, and China.

63. TETTIGONIA TRIPARS, n. s. Lætè rufa subtùs ænea, capite brevi rotundato vittis duabus nigris, fronte testaceâ margine nigricante, abdomine obscurè rufo fasciis nigricantibus apice æneo, pedibus testaceis, tarsis nigris, alis anticis testaceis glaucescentibus basi rufis, posticis fuscis.

Bright red, dark æneous beneath. Head short, rounded, nearly semicircular; vertex with two black stripes; front dull testaceous, with a blackish border. Abdomen dull dark red, with blackish bands; tip æneous. Legs dark testaceous; tarsi black. Fore wings dull testaceous, with a glaucous bloom, bright red at the base. Hind wings brown. Length of the body 5 lines; of the wings 10 lines.

Malacca.

64. TETTIGONIA SUAVISSIMA, n. s. Nigra subtùs alba, capite brevi-conico vittâ guttisque duabus nigris, thoracis lateribus luteis, pectore maculis nigris, abdomine luteo maculis lateralibus fasciâ rufâ apice albo, alis anticis fuscis apices versus pallidioribus strigâ obliquâ rufâ anticè limpidis costâ luteâ, posticis fuscis apud costam limpidis basi nigricantibus.

Nearly allied to *T. semiclara*, *Signoret*, and to *T. stellata*, *Sign.*, and forming with them a distinct group in the genus. Black, white beneath. Head short-conical, rounded in front, white with a black stripe and two black dots. Thorax luteous on each side. Pectus with black spots. Abdomen luteous with black spots on each side, red towards the tip which is white. Legs white. Fore wings dark brown, paler brown with an oblique red streak towards each tip, interruptedly limpid along the costa which is luteous. Hind wings brown, limpid along the costa, blackish at the base. Length of the body 4 lines; of the wings 10 lines.

Singapore.

65. TETTIGONIA JOCOSA, n. s. Rufa subtùs alba, capite albo brevi rotundato lateribus nigris, thorace vittis quinque testaceis duabusque albis, pedibus albis, alis anticis albo-vittatis fasciâ luridâ basi testaceis apice fuscis, posticis cinereis.

Red, white beneath. Head white, short, rounded, nearly semicircular; front

black on each side. Thorax with five testaceous stripes and with two white stripes. Legs white. Fore wings with several various white stripes, testaceous at the base, lurid towards the tips which are brown. Hind wings dark grey. Length of the body 3 lines; of the wings 7 lines. Mount Ophir.

Coh. SCARIDES, *Amyot et Serv.*

Gen. LEDRA, *Fabr.*

66. LEDRA CULTELLIFERA, n. s. Testacea punctis pallidioribus, capite conico, scutello attenuato, oviductu fulvo apice nigro, alis anticis subtuberculatis, posticis limpidis.

Testaceous. Head and thorax with minute paler dots. Head conical, broader than long. Scutum about twice broader than long. Scutellum attenuated and acuminate at the tip. Oviduct tawny, with a black tip. Fore wings very minutely tuberculate. Hind wings limpid. Length of the body $6\frac{1}{2}$ lines; of the wings 12 lines.

Singapore.

67. LEDRA CONIFERA, n. s. Fulva tuberculis pallidis, subtus testacea, capite conico, alis anticis testaceis venis ex parte rufescentibus, posticis limpidis.

Tawny, testaceous beneath. Head and thorax thickly covered with very minute pale tubercles. Head conical, hardly broader than long. Scutum not twice broader than long. Scutellum acuminate. Fore wings testaceous, very minutely tuberculate; veins partly reddish. Hind wings limpid. Length of the body 6 lines; of the wings 10 lines.

Singapore.

68. LEDRA NIGRILINEA, n. s. Testacea subpunctulata, capite scutique lateribus nigro marginatis, capite brevi-conico, alis posticis limpidis.

Testaceous, very minutely punctured. Head and sides of the scutum bordered with black. Head short-conical, twice broader than long. Scutum not twice broader than long. Scutellum acuminate. Hind wings limpid. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Singapore.

Gen. PENTHIMIA, *German.*

69. PENTHIMIA CASTANEA, n. s. Ferruginea levis nitens, capite anticè subtusque pectoris margine antico maculisque duabus nigris, pedibus nigris, tibiis spinosissimis, alis anticis apices versus luridis maculis nigris.

Ferruginous, smooth, shining. Head black in front and beneath. Pectus black in front and with a black spot on each side behind. Legs black; tibiae very spinose. Fore wings lurid, and with black spots towards the tips. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

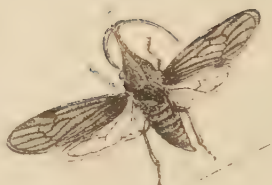
Malacca.

Coh. IASSIDES, *Amyot et Serv.*

Gen. ACOCEPHALUS, *German.*

70. Acocephalus olivaceus, *Walk. Cat. Homopt.* pt. 3. 846. 1.

Malacca. Inhabits also the Philippine Islands.



Gen. CÆLIDIA, *Germar.*

71. CÆLIDIA GUTTIVENA, n. s., fœm. Nigro-anea, capite viridi-testaceo, verticis guttis duabus frontisque vittis duabus rufis, thorace punctis testaceis, pectore abdomineque testaceis ex parte nigris, pedibus testaceis, tibiis tarsisque apice nigris, alis anticis hyalino-bifasciatis apicibus semihyalinis venis nigris lateo-guttatis, posticis cinerascensibus.

Female. Blackish-aneous. Head greenish testaceous, with two red spots on the vertex, and with two red stripes in front. Thorax thickly covered with testaceous points. Pectus and abdomen testaceous, partly black. Legs testaceous; tips of the tibiæ and of the tarsi black. Fore wings with two hyaline bands, and with semihyaline tips; veins black, with very numerous luteous dots. Hind wings greyish. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Malacca.

72. CÆLIDIA PUNCTIVENA, n. s., fœm. Nigro-anea, capite testaceo strigis tribus abbreviatis nigris, thorace punctis testaceis, pectore et abdomine nigris ex parte testaceis, pedibus nigricantibus, alis anticis testaceo-guttatis venis luteo-guttatis, posticis cinerascensibus.

Female. Blackish-aneous. Head dull testaceous, with three short black streaks between the eyes. Thorax thickly covered with testaceous points. Pectus and abdomen black, partly testaceous. Legs blackish. Fore wings with numerous minute testaceous dots between the veins which are black, with minute luteous dots. Hind wings greyish. Length of the body 4 lines; of the wings 9 lines.

Malacca.

Ord. PHYTOPHTHIRE, *Burmeister.*Fam. COCCIDÆ, *Leach.*Gen. MONOPHLEBUS, *Leach.*

73. Monophlebus atripennis, *Klug, Handb.* ii. 80.

Malacca and Singapore. Inhabits also Hindostan.

DESCRIPTION OF PLATES.

PLATE III.

Fig. 1. *Eupilis albilineola*, p. 93; 1*a*, head and rostrum seen in front; 1*b*, the same seen sideways; 1*c*, the extremity of the body seen sideways.

Fig. 2. *Micreune formidanda*, p. 94.

Fig. 3. *Benna capitulata*, p. 90; 3*a*, the head and rostrum seen in front; 3*b*, the same seen sideways; 3*c*, the abdomen seen beneath.

Fig. 4. *Cromna acutipennis*, p. 85; 4*a*, the head and rostrum seen in front; 4*b*, the same seen sideways; 4*c*, the abdomen seen sideways.

Fig. 5. *Colobesthes marginata*, p. 92; 5*a*, the head and rostrum seen in front; 5*b*, the same seen sideways; 5*c*, the abdomen seen sideways.

PLATE IV.

- Fig. 1. Colsa costæstriga*, p. 96; 1*a*, the head and rostrum seen in front; 1*b*, the same seen sideways.
- Fig. 2. Bidis notivena*, p. 88; 2*a*, the head and rostrum seen in front; 2*b*, the same seen sideways.
- Fig. 3. Conna guttifera*, p. 90; 3*a*, the head and rostrum seen in front; 3*b*, the same seen sideways.
- Fig. 4. Elica latipennis*, p. 86; 4*a*, the head and rostrum seen in front; 4*b*, the same seen sideways.
- Fig. 5. Daradax fusipennis*, p. 86; 5*a*, the head and rostrum seen in front; 5*b*, the same seen sideways; 5*c*, the extremity of the abdomen seen sideways.
- Fig. 6. Euria lurida*, p. 88; 6*a*, the head and rostrum seen in front; 6*b*, the same seen sideways; 6*c*, the extremity of the abdomen seen sideways.

On the Occurrence of *Sepia biserialis* in Cornwall.

By JONATHAN COUCH, Esq., F.L.S. &c.

[Read March 4th, 1856.]

It appears from the "History of British Mollusca," by Professor E. Forbes and Mr. Hanley (vol. iv. p. 241, and Pl. P.P.P.), that the *Sepia biserialis* is regarded as of very rare occurrence in Britain; one specimen only of its shell or plate having been found in England and three in Ireland. The English specimen was obtained on the shore of the county of Northumberland. It may therefore be regarded as of some importance in the completion of our local fauna, to make the Linnean Society acquainted with the fact, that in the course of two days in the month of February of the present year I have myself found no less than ten specimens of the dorsal plate or shell of this animal, scattered among perhaps a hundred of those of the Common Bone or Burn Cuttle, *Sepia officinalis*.

My attention was attracted to these specimens by the beautiful pale pink colour of the dorsal aspect of the shell; and a very slight examination of the most perfect specimen I could find, compared with those of the common species, was sufficient to point out the decided distinction there is between them; but as the shell of this species is but little known, and those which have fallen into my hands are slightly different from what is described in the work above referred to, I beg leave to lay before the Society a more particular description than might otherwise be necessary.

The length of this shell, as described by Professor Forbes, was



$2\frac{1}{2}$ inches, and the breadth (I suppose without the membranous wing) was $\frac{1}{12}$ ths of an inch; but in the most perfect of my specimens, which however is defective at its blunt end, the length is 4 inches, and the breadth, including the membranous border, $1\frac{5}{8}$ inch. The form is much more slender than in the common species, and, as it approaches the mucro or spur, may be described as lancet-shaped. The spur projects much more considerably than in the *Sepia officinalis*, although in the latter I find a difference in different specimens. In the *S. biserialis* it advances $\frac{1}{8}$ th of an inch beyond the membranous border in a straightforward direction, whereas in the *S. officinalis* it is depressed and bent inward. The membranous border at this part is also turned inward, so as to enclose a cavity, and conceal the narrower portion of the shell. The structure of this spur in the *S. biserialis* is also different; for while that of the common species is for the most part hooked, round and simple, in the *S. biserialis* it is slightly lobed or keeled. I have not been able to assure myself of its shape at the point, as in my most perfect specimen it was a little injured.

In addition to these well-marked distinctions, the rarer species is smooth on its dorsal aspect at that part where the more common is covered with a decided graining. The transverse striæ are also much more numerous, and of a finer structure. Their direction also at the sides is not so bent towards the slender extremity.

It is still a subject of interesting inquiry whether the animal to which this shell or plate belongs is truly a native of our own waters, since it does not appear that any observer has ascertained its existence. It is to be observed, however, that although the whole of these specimens were injured, and most of them much broken, they were scarcely more so than were those of the common species, which is, beyond question, common on our coasts. The two species were lying together on the beach, as they had been left by the tide; and although there were at no great distance from them many specimens of the stalks of the American maize, clothed with perfect leaves—and although without heads of grain, still bearing clumps of the male flowers,—yet we cannot conclude from the presence of these foreign plants that the shells can have come to us from a considerable distance, since those of the *Sepia officinalis* certainly have not done so, and the leaves and stalks of the plants bear no marks of long immersion or of a distant voyage. It is probable that they were thrown overboard from

some ship, as is often the case with foreign productions which we find cast up on our shores.

Polperro, 1856.

Notice of the "Borer," a Caterpillar very injurious to the Sugar-Cane. By J. O. WESTWOOD, Esq., F.L.S. &c.

[Read June 3rd, 1856.]

[Abstract.]

MR. WESTWOOD gave an account of the natural history of the "Borer," or caterpillar of a moth which is at the present time doing immense damage to the sugar-canes in the island of Mauritius. A committee had been formed in the island, composed of the chief planters and scientific individuals, for the purpose of investigating the subject, and from the able report which they had drawn up, it appears that the insects were in all probability imported with a cargo of new cane plants from the island of Ceylon several years ago, and that since that time the damage has been rapidly extending, and now threatens the entire destruction of the plantations. The female insect deposits her eggs in the axils of the young leaves, and the larvæ as soon as hatched bore into the stem, forming long galleries filled with the excrement of the insect, and which have the effect of bringing the stem into such a state of disease, that no crystallization will take place, and the plant becomes quite useless even for making rum. The entire transformations of the insect are effected in about six weeks, so that there are at least six successive generations in the course of a year. It appears that the chrysalis state is passed in a slight cocoon spun amongst the dead leaves of the plant; and the committee, after reviewing various proposals suggested for the destruction of the insect, had come to the conclusion that a well-organized system of burning the infested canes, as well as all loose rubbish and leaves in the plantation, was the only practicable means of getting rid of the enemy. Dr. Ulcoq, an extensive sugar-cane planter in the island, who was present at the meeting, confirmed the details contained in the report, and begged for any suggestions which could be offered by scientific men in this country for the purpose of remedying the evil. He had already been in communication with M. Guérin-Méneville and other naturalists in Paris.

Several of the members present took part in the discussion

upon the subject, and especially dwelt on the care necessary in the selection and treatment of the cuttings of the cane-tops for future plantations. The destruction of the eggs and young larvæ attached to such shoots would be effected if the latter were kept immersed in damp furrows, but the nature of the soil of the island prevented such a process; their immersion in a liquid capable of destroying the insect embryo without hurting the plant was also insisted upon; as well as the placing of the cuttings for a time in a close atmosphere saturated with the fumes of prussic acid arising from bruised laurel-leaves, which would certainly destroy the insect.

From the account given of this Mauritian borer, it appears identical with the borer of the West Indian plantations described by Fabricius under the name of *Phalæna saccharalis*, and by the Rev. L. Guilding under that of *Diatræa Sacchari* in a memoir published in the Transactions of the Society of Arts, for which he received the Gold Ceres Medal from the Society.

Notice of a Specimen of Insect-wax from China.

By DANIEL HANBURY, Esq., F.L.S. &c.

[Read April 15th, 1856.]

[Abstract.]

MR. D. HANBURY exhibited a specimen of Chinese Insect-wax in the crude state, attached to the branch on which it had been formed by the insect, *Coccus Pe-la*, Westw.* (*C. sinensis*, Westw. Pharm. Journ. xii. 478).

The specimen was obtained by Dr. M'Cartee of Ningpo, at a spot about fourteen miles N.E. of that city. The exact locality is described as "three miles from Chin-hae, southerly, behind the first range of hills across the river,—in the direction of Ling-fung," where the trees supporting the wax-insect occur on the banks of the canals.

Dr. M'Cartee procured specimens for Mr. Fortune, which that gentleman has taken to India with the view of introducing the insect into that country. He also sent specimens to William Lockhart, Esq., of Shanghai, through whose kindness that exhibited was received.

It may be remarked that, according to the Chinese accounts

* Gardener's Chronicle for Aug. 20, 1853 (p. 532).

the trees upon which the wax-insect lives are of two or three species. Of one of these, resembling an ash, a dried specimen was on the table. Mr. Lockhart has in his garden at Shanghai a small wax-tree of this species which he hopes shortly to colonize with the wax-insect. The tree has not yet flowered, and its botanical position is as yet undetermined. A living plant of the same species was brought to England by Mr. Fortune, from whose hands it passed into those of Messrs. Rollisson and Sons of Tooting.

Specimens of the manufactured insect-wax from China were also on the table.

Note on Insects producing Wax from Port Natal and China.

By J. O. WESTWOOD, Esq., F.L.S. &c.

[Read April 15th, 1856.]

THE wax-insect from Natal, exhibited by Mr. W. W. Saunders, is the female of a large species of *Coccus*, analogous to the *Coccus ceriferus*; each female being about the size of a pea, and of a dark chestnut colour, but encased in a solid layer of white waxy matter nearly a quarter of an inch thick, so as to make the entire insect as large as a boy's marble; the under side being flattened, or rather concave, so as to fit the convex surface of the branch on which they are found. The size of the insect would render it easy of observation, and the thickness of the wax would make it a more important object of commerce than the wax-insects of South America.

The Chinese wax-insect, of which so fine a specimen on the branch has been exhibited by Mr. Daniel Hanbury, differs from the latter by the waxy matter being deposited over the surface of the branch, and not confined to a coating of the insect. The specimens submitted to my examination are probably of considerable age, as they have been much deteriorated in a commercial point of view, by being attacked by other insects, namely a species of ant, of which I found the heads and other parts of several specimens; and a species of moth, of which I found portions of many chrysalides; the larvæ of which, I do not doubt, had devoured the animal matter of the *Cocci*, as well as burrowed into the wax. There were also some fragments of a *Curculio* (*Otiorynchus*?), but these, I suppose, must have been taken accidentally on the trees in collecting the *Cocci*.

Catalogue of the Dipterous Insects collected at Sarawak, Borneo,
by Mr. A. R. WALLACE, with Descriptions of New Species.
By FRANCIS WALKER, Esq., F.L.S.

[Received Sept. 15, 1856.]

Fam. MYCETOPHILIDÆ, *Haliday*.

Gen. SCIARA, *Meigen*.

Div. A. a. *Meig.* vi. 305.

1. SCIARA LATICORNIS, n. s., mas et fœm. Nigra, antennis validis, thorace nitido. Mas. Alis subnigricantibus. Fœm. Abdomine ferrugineo, alis nigricantibus.

Male and Female. Black. Antennæ stout. Thorax shining. *Male.* Wings slightly blackish. *Female.* Abdomen ferruginous. Wings blackish. Length of the body 3-4 lines; of the wings 5-6 lines.

2. SCIARA SOLITA, n. s., fœm. Nigra, antennis gracilibus, thorace abdominisque apice subnitidis, pedibus piceis, alis subnigricantibus.

Female. Black. Antennæ slender. Thorax and tip of the abdomen slightly shining. Legs piceous. Wings slightly blackish. Length of the body $1\frac{1}{4}$ line; of the wings 3 lines.

Fam. CECIDOMYZIDÆ, *Haliday*.

Gen. CECIDOMYIA, *Latreille*.

3. CECIDOMYIA DEFERENDA, n. s., fœm. Fusca, capite nigro, thorace rufescente, pedibus testaceis, alis albidis, venis halteribusque testaceis.

Female. Brown. Head black. Thorax reddish. Legs testaceous. Wings whitish, ciliated; veins and halteres pale testaceous; subcostal vein ending at a little before the middle of the costa; cubital vein ending at the tip of the wing; hind branch of the anal vein straight, and proceeding obliquely to the hind border. Length of the body $1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$ lines.

Fam. BIBIONIDÆ, *Haliday*.

Gen. PLECIA, *Hoffmansegg*.

4. PLECIA dorsalis, *Walk.* See page 5.

5. PLECIA SUBVARIANS, n. s., mas et fœm. Atra. Mas. Thorace rufo, alis subnigricantibus. Fœm. Thorace rufescente, alis nigricantibus.

Male and Female. Deep black. *Male.* Thorax bright red. Wings slightly blackish. *Female.* Thorax dull red. Wings blackish. Length of the body $1\frac{1}{2}$ -2 lines; of the wings 4-5 lines.

This species may be distinguished from *P. dorsalis* by its narrower wings.

Fam. CULICIDÆ, *Haliday*.

Gen. CULEX, *Linn.*

6. Culex fuscus, *Wied.* See page 5.

Fam. TIPULIDÆ, *Haliday*.Gen. LIMNOBIA, *Meigen*.

Div. n.

Veins of the wings like those of Div. S. *Meig.* (*Zweifl.* i. 147. pl. 4. f. 17), with the exception of the subcostal vein, which is not connected with the costal, but emits a veinlet at its tip to the radial.

7. LIMNOBIA IMPRESSA, n. s., fœm. Fusca, capite nigro, thoracis lateribus testaceo-marginatis, pectore cano, abdomine lutescente fasciis fuscis, pedibus pallidè fusciscentibus, genubus testaceis, alis subcinereis venis nigris.

Female. Brown. Head and antennæ black. Lateral segments of the thorax with testaceous borders. Pectus hoary. Abdomen somewhat luteous, with brown bands. Legs slender, pale brownish; knees testaceous. Wings greyish; veins black. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Div. n.

Veins of the wings much like those of Div. E. *Meig.* (*Zweifl.* i. 125. pl. 6. f. 2), but the veinlet which connects the subcostal vein with the radial is far beyond the base of the fork of the latter, the cubital parts from the radial at some distance from the veinlet which connects it with the 3rd externo-medial, and the veinlet between the 3rd externo-medial and the subanal is very near the base of the discal areolet.

8. LIMNOBIA RUBRESCENS, n. s., mas. Ferrugineo-rufa, capite pedibusque nigris, pectore ventre femoribus basi coxisque rufescentibus, abdomine vittâ dorsali nigricante, alis fusco-cinereis venis stigmatique nigricantibus.

Male. Ferruginous red, paler beneath. Head, antennæ and legs black. Abdomen with a blackish stripe. Femora at the base and coxæ reddish. Wings brownish-grey; veins and stigma blackish. Length of the body 5 lines; of the wings 12 lines.

Div. n.

Veins of the wings much like those of Div. E. *Meig.* (*Zw.* i. 125. pl. 6. f. 2), but the veinlet which connects the subcostal vein with the radial is beyond the base of the fork of the latter, and the veinlet between the 3rd externo-medial vein and the subanal is opposite the middle of the discal areolet.

9. LIMNOBIA PYRRHOCHROMA, n. s., mas. Ochraceo-rufa, capite nigro?, pedibus nigris, femoribus basi coxisque fulvis, alis cinereis venis fuscis.

Male. Ochraceous red. Head black? Legs black, slender; femora towards the base and coxæ tawny. Wings grey; veins brown. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Div. n.

Differs from all the other divisions of *Limnobia* by the contorted petiole of the radial and cubital veins, and by the radial vein which near its base forms an angle emitting a branch; externo-medial veins simple; discal areolet sub-

hexagonal, about twice longer than broad; veinlet between the 3rd externo-medial vein and the subanal near the base of the discal areolet.

10. *LIMNOBIA ARGENTO-CINCTA*, n. s., fœm. Nigra, antennis verticillato-pilosis, thorace nitido, abdomine fasciis argenteis, femoribus subclavatis, alis cinereis venis nigris nebulosis.

Female. Black. Antennæ verticillate-pilose. Thorax shining. Abdomen with silvery bands. Femora subclavate. Wings grey; veins black, slightly clouded with black. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. *PTEROCOSMUS*, *Walk.*

Limnobia leucotelus and *L. plecioides*, p. 6, and other species, may be placed in this genus; the structure of their wing-veins differs somewhat from that of Meigen's Div. 1.

11. *PTEROCOSMUS LUNIGERUS*, n. s., mas. Ater, pedibus piceis, alis violaceo-nigricantibus apice testaceis maculâ discali sublunatâ albâ.

Male. Deep black. Legs piceous. Wings black, with violet reflections, testaceous at the tips, and with a white slightly curved discal white spot. Length of the body 5 lines; of the wings 8 lines.

12. *PTEROCOSMUS INFIXUS*, n. s., mas et fœm. Niger, thorace ferrugineo, abdomine antico flavescente, vittâ viridi, pedibus ferrugineis, femoribus tibiisque apice tarsisque nigris, alis violaceo-nigricantibus fasciâ brevi discali maculâque subapicali albis. Fœm. Abdominis segmentis posterioribus nigris fulvo marginatis, terebrâ ferrugineâ.

Male and Female. Black. Thorax and legs ferruginous. Abdomen towards the base yellowish, and with a green stripe. Tarsi and tips of the femora and of the tibiæ black. Wings blackish, with violet reflections, adorned with a short white discal band and with a subapical white spot.

Female. Hinder segments of the abdomen black, with tawny borders; oviduct ferruginous. Length of the body 5-6 lines; of the wings 10 lines.

13. *PTEROCOSMUS OPTABILIS*, n. s., mas. Ater, abdomine luteo basi fasciâque latâ posticâ atris, pedibus piceis, alis nigricantibus apice subcinereis fasciâ brevi discali albâ.

Male. Deep black. Abdomen luteous, black at the base, and with a broad black posterior band. Legs piceous, very slender. Wings blackish, with violet reflections, greyish hyaline at the tips, with a limpid mark by the interior angle, and with a short white discal band. Length of the body 3 lines; of the wings 6 lines.

14. *PTEROCOSMUS COMBINATUS*, n. s., fœm. Saturatè rufo-ferrugineus, capite nigro, abdomine fasciâ anticâ testaceâ, terebrâ pedibusque pallidè fulvis, alis violaceo-nigricantibus guttis costalibus et marginalibus maculâ discali lunulâque subapicali albis costâ testaceâ.

Female. Deep reddish ferruginous. Head and antennæ black. Abdomen with an anterior testaceous band. Oviduct, legs and halteres pale tawny. Tarsi blackish towards the tips. Wings blackish, with violet reflections, with a few marginal white dots, with two white spots (one discal, the other

subapical), and with a limpid mark on the hind part of the base; costa testaceous. Length of the body 8 lines; of the wings 12 lines.

15. *PTEROCOSMUS DILUTUS*, n. s. Saturatè rufus, capite nigro, antennis pedibus halteribusque testaceis, alis cinereis costâ testaceâ venulis transversis nigricante nebulosis maculâ discali guttisque marginalibus albis.

Nearly allied to the preceding species, of which it may be an immature variety. Deep red. Head black. Antennæ, legs and halteres pale testaceous. Tarsi a little darker towards the tips. Wings greyish, pale testaceous along the costa, with a discal white spot, and with some white marginal dots of various size; transverse veinlets slightly clouded with black. Length of the body 6 lines; of the wings 10 lines.

Gen. *TIPULA*, *Linn.*

16. *Tipula pedata*, *Wied. Auss. Zweifl. i. 45. 7.*

Inhabits also Java.

17. *TIPULA VILIS*, n. s., mas. Fusca, antennis subverticillato-pilosis, thorace ferrugineo nitido, femoribus basi fulvescentibus, alis subcinereis venis stigmatæque nigris.

Male. Brown. Antennæ short, slightly verticillate-pilose. Thorax ferruginous, shining. Legs slender; femora somewhat tawny towards the base. Wings very slightly greyish; stigma and veins black. Length of the body 4 lines; of the wings 10 lines.

Fam. *STRATIOMIDÆ*, *Haliday.*

Gen. *PTILOCERA*, *Wied.*

18. *Ptilocera quadridentata*, *Fabr.* See page 7.

Gen. *CLITELLARIA*, *Meigen.*

19. *Clitellaria varia*, *Walk.* See page 7.

20. *Clitellaria flaviceps*, *Walk.* See page 7.

21. *CLITELLARIA NOTABILIS*, n. s., fœm. Nigro-cyanea, capite halteribusque pallidè testaceis, antennis pedibusque nigris, abdomine cyaneo, alis fuscis costam versus nigricantibus.

Female. Blackish-blue. Head pale testaceous. Antennæ and legs black. Thorax with a band and a stripe of grey tomentum. Abdomen blue, with grey tomentum beneath. Wings dark brown, blackish along the costa. Length of the body 5 lines; of the wings 10 lines.

Gen. *CYCLOGASTER*, *Macquart.*

22. *CYCLOGASTER DETRACTA*, n. s., fœm. Nigra, cinereo-pubescent, antennis fulvis, aristâ albidâ elongatâ tenui, pedibus albidis, coxis femoribusque nigris, alis subcinereis venis sordidè albidis.

Female. Black, with grey down. Head shining. Antennæ tawny; arista

whitish, elongated, filiform. Legs whitish; coxæ and femora black. Wings very slightly greyish; veins dingy whitish. Halteres whitish. Length of the body 2 lines; of the wings 4 lines.

23. *CYCLOGASTER INFERA*, n. s., fœm. Nigra cinereo-pubescentis, antennis nigris, articulo 1° fulvo, 3° valido; pedibus albidis, coxis femoribusque nigris, alis limpidis venis albidis.

Female. Black, with grey down. Head shining. Antennæ black; 1st joint tawny; arista stout. Legs whitish; coxæ and femora black. Wings limpid; veins whitish. Halteres white. Length of the body 2 lines; of the wings 4 lines.

Gen. *CULCUA*, n. g.

Caput parvum; frons declivis. *Antennæ* breves; articulus 3^{us} rotundus; arista apicalis, longa, tenuis, setiformis. *Thorax* productus, longiconicus. *Scutellum* quadrispinosum. *Abdomen* crassum, subrotundum, thorace brevius et latius. *Pedes* breves, simplices. *Alæ* sat angustæ. *Mas. Oculi* suprâ connexi.

Head small; front vertical. Antennæ short; 3rd joint round; arista long, slender, setiform, apical. Thorax elongate-conical, produced in front. Scutellum with 4 spines. Abdomen thick, nearly round, shorter and broader than the thorax. Legs short, slender, unarmed. Wings rather narrow; structure of the veins like that of *Clitellaria*.

Male. Eyes connected above.

24. *CULCUA SIMULANS*, n. s., mas. Nigra, capite albo-tomentoso, antennis fulvis, thorace et abdomine fasciis cinereo-pubescentibus, scutelli spinis fulvis, alis subcinereis fasciâ mediâ nonnunquam subinterruptâ apiceque latè nigricantibus.

Male. Black. Head with white tomentum. Antennæ tawny. Thorax and abdomen with bands of grey down. Scutellum with tawny spines. Legs pubescent. Wings slightly greyish, blackish towards the tips, and with a sometimes nearly interrupted blackish band. Length of the body 3-3½ lines; of the wings 5-6 lines.

This species also inhabits Malacca, and was accidentally omitted in the descriptions of the Malay species.

Gen. *EVAZA*, n. g.

Corpus planum, subglabrum. *Caput* thoracis latitudine. *Antennæ* breves; articulus 1^{us} longiusculus; 3^{us} rotundus; arista apicalis, longa, gracilis, setiformis. *Thorax* ellipticus. *Scutellum* quadri-spinosum. *Abdomen* subellipticum, thorace paulò longius, vix latius. *Pedes* graciles, simplices. *Alæ* sat longæ, vix latæ. *Mas. Oculi* magni, suprâ connexi.

Body rather flat, nearly bare. Head as broad as the thorax. Antennæ short; 1st joint rather long; 3rd round; arista long, slender, setiform, apical. Thorax elliptical. Scutellum with 4 rather long spines. Abdomen flat, elliptical, a little longer but hardly broader than the thorax. Legs slender, unarmed. Wings rather long, moderately broad; structure of the veins like that of *Clitellaria*.

Male. Eyes large, connected above.

25. *EVAZA BIPARS*, n. s., mas. Nigra nitida, oculis rufis, antennis scutelli margine postico spinisque pedibus halteribusque pallidè flavescens, abdominis disco flavescens, alis cinereis stigmate venisque nigricantibus.

Male. Black, shining. Eyes red. Antennæ, hind border and spines of the scutellum, legs and halteres pale yellow. Arista black. Thorax with a testaceous line on each side. Disk of the abdomen yellowish. Wings grey; stigma and veins blackish, the latter testaceous at the base. Length of the body 3 lines; of the wings 6 lines.

Gen. *SARGUS*, *Fabr.*

26. *Sargus metallinus*, *Fabr. Syst. Antl.* 258. 11.

Inhabits also Hindostan and Java.

27. *Sargus luridus*, *Walk.* See page 8.

28. *SARGUS LATIFASCIA*, n. s., mas. Fulvus, antennis pectore abdomine pedibusque testaceis, abdomine fasciis latis nigris, pedum posteriorum femoribus nigro vittatis, tibiis tarsisque nigris, his albido fasciatis, alis cinereis venis nigris basi fulvis.

Male. Tawny. Antennæ, pectus, abdomen and legs testaceous. Abdomen with broad black bands. Hind femora striped with black; hind tibiæ and hind tarsi black, the latter with a whitish band. Wings grey; veins black, tawny at the base. Length of the body 5 lines; of the wings 11 lines.

Fam. *TABANIDÆ*, *Leach.*

Gen. *TABANUS*, *Linn.*

29. *Tabanus hybridus*, *Wied. Auss. Zweifl.* i. 557. 31.

Inhabits also Macao.

30. *Tabanus univentris*, *Walk.* See page 9.

Var. Abdomen luteous-tawny, with an indistinct paler dorsal stripe.

31. *TABANUS NEXUS*, n. s., fœm. Ferrugineus subtùs canescens, callo piceo elongato, antennis nigris, thorace vittis subobsoletis rufescentibus, abdomine rufescente e maculis trigonis testaceis univittato, pedibus rufescentibus, femoribus anticis tibiis anticis apice tarsisque nigris, alis cinereis venis fusco marginatis, halteribus pallidè luteis.

Female. Very nearly allied to *T. univentris*. Ferruginous, somewhat hoary beneath. Callus piceous, long and slender. Proboscis black. Lancets ferruginous. Palpi brown. Antennæ black; angle of the 3rd joint small. Thorax with indistinct reddish stripes. Abdomen reddish, with a testaceous triangular spot on the hind border of each segment. Legs reddish; fore femora, tips of the fore tibiæ and tarsi black. Wings grey; veins black, clouded with brown. Halteres pale luteous. Length of the body 8 lines; of the wings 16 lines.

32. *TABANUS FUMIFER*, n. s., mas et fœm. Fuscus subtùs cinereus, abdomine ferrugineo-rufò apicem versus nigro segmentorum marginibus posticis testaceis, pedibus nigris, tibiis ferrugineo vittatis, alis fuscis. Mas. An-

tennis ferrugineis, alarum margine postico cinereo. Fœm. Antennis nigris, basi ferrugineis, abdomine maculis dorsalibus subtrigonis testaceis, alarum areolis cinereo vittatis.

Male and Female. Very nearly allied to *T. univentris*. Brown, cinereous beneath. Abdomen ferruginous-red, black towards the tip; hind borders of the segments testaceous. Legs black; tibiæ with ferruginous stripes. Wings brown; veins black. Halteres pale luteous. *Male.* Eyes æneous, and with very small facets in front. Antennæ ferruginous. Wings grey along the hind border, and with indistinct grey streaks on the areolets elsewhere. *Female.* Antennæ black, ferruginous at the base. Abdomen with a small nearly triangular spot on the hind border of each segment. Areolets of the wings with cinereous disks. Length of the body 6-7 lines; of the wings 12-14 lines.

33. *TABANUS OPTATUS*, n. s., fœm. Ferrugineus subtùs canus, capite antico albedo callo lanceolato, antennis nigris basi fulvis, thoracis lateribus testaceis, scutello cano, abdomine fulvo vittâ posticè dilatâ nigrâ guttis dorsalibus albidis, pedibus nigris, tibiis anticis basi tibiisque posterioribus fulvis, alis nigro-fuscis apice lato margineque postico subcinereis maculâ mediâ sublimpidâ.

Female. Ferruginous, hoary beneath. Head whitish in front. Callus lanceolate. Proboscis black. Palpi testaceous. Antennæ black, tawny at the base; angle of the third joint acute, slightly elongated. Thorax with three darker lines; sides testaceous. Scutellum hoary. Abdomen tawny; hind borders of the segments beneath and on each side above testaceous; a black dorsal stripe which is dilated hindward; a whitish nearly triangular dot on the hind border of each segment. Legs black; fore tibiæ at the base and hinder tibiæ tawny. Wings blackish-brown; apical third part and hind border slightly cinereous; a nearly limpid discal spot before the middle; veins black. Halteres blackish. Length of the body 6 lines; of the wings 12 lines.

34. *TABANUS SIMPLICISSIMUS*, n. s., mas et fœm. Cinereus, callo trigono piceo, antennis fulvis, thoracis lateribus testaceis, abdomine testacco apice nigricante, pedibus nigris. *Mas.* Tarsis posterioribus basi tibiisque posterioribus testaceis, tibiis anticis testaceis apice nigris, alis sublimpidis costâ venisque testaceis. *Fœm.* Femoribus apice fulvis, tibiis albidis, anticis apice nigris, tarsis posterioribus basi fulvis, alis cinereis apud costam luridis venis nigris basi ferrugineis.

Male and Female. Cinereous. Callus at the base of the antennæ broad, triangular, piceous. Palpi testaceous. Antennæ tawny; 3rd joint not dilated nor dentate. Sides of the thorax testaceous. Abdomen testaceous, blackish at the tip. Legs black.

Male. Eyes in front æneous, and with very minute facets. Tibiæ testaceous; fore tibiæ with black tips; hinder tarsi testaceous at the base. Wings nearly limpid, very slightly cinereous; costa, veins and halteres testaceous.

Female. Callus between the eyes long and slender. Femora with tawny tips; tibiæ whitish; fore tibiæ with black tips; hinder tarsi tawny towards the base. Wings cinereous, lurid along the costa; veins black, ferruginous towards the base. Length of the body $3\frac{1}{2}$ - $4\frac{1}{2}$ lines; of the wings 7-8 lines.

Gen. CHRYSOPS.

35. *Chrysops dispar*, *Fabr.* See p. 9. "Very abundant in the jungle at Sarawak."

36. *Chrysops fasciatus*, *Wied. Auss. Zweifl.* i. 198. 5.
Inhabits also Java.

37. *CHRYSOPS FIXISSIMUS*, n. s., fœm. *Picea*, capite thoracisque marginibus aureo-pubescentibus, capitis callo atro, facie ferruginèâ guttis duabus lateralibus nigris, antennis nigris basi fulvis, abdomine fulvo fasciis tribus nigricantibus, pedibus fulvis, tibiis subdilatatis nigricantibus, alis subcinereis costâ apice fasciâque latâ nigro-fuscis.

Var. Abdomine bifasciato basi testaceo.

Female. Piceous. Head and borders of the thorax with gilded down. Head with a black shining callus above the antennæ; face ferruginous, shining, with a black dot on each side. Palpi tawny. Antennæ black, tawny at the base. Abdomen tawny, with three blackish bands. Legs tawny; femora and tarsi with piceous tips; tibiæ and fore tarsi black, the former slightly dilated. Wings very slightly cinereous, brown along the costa and at the tips, and with a broad brown band. Halteres testaceous.

Var. Abdomen testaceous at the base, with two bands, the fore one black, the hind one brown. Length of the body $3\frac{1}{2}$ –4 lines; of the wings 7–8 lines.

Gen. HÆMATOPOTA, *Meig.*

38. *Hæmatopota roralis*, *Fabr. Syst. Antl.* 107. 2.
"Eyes above opal white, with black specks."

39. *HÆMATOPOTA ATOMARIA*, n. s., fœm. Nigro-picea, capite anteo atro nitido, antennis nigris basi nitidis, abdominis marginibus posticis canis, tibiis albido cinetis, alis nigricantibus guttis plurimis annuloque unico albis.

Female. Piceous-black. Head black and shining in front. Palpi ferruginous. Antennæ black; 1st joint shining. Abdominal segments with hoary hind borders. Tibiæ with a whitish band on each. Wings blackish, with very numerous white dots, and with one white ringlet which is by the costa at two-thirds of the length. Length of the body 3 lines; of the wings 6 lines.

Fam. ASILIDÆ, *Leach.*Subfam. DASYPOGONITES, *Walk.*Gen. DASYPOGON, *Fabr.*Subgen. MICROSTYLUM, *Macq.*

40. *Dasypogon Vica*, *Walk. Cat. Dipt.* pt. 2. 304.
Inhabits also Silhet.

41. *DASYPOGON INCOMPTUS*, n. s., mas. Nigro-cinereus subtus canescens, facie ferruginèâ, antennis pedibusque nigris, thorace vittis quatuor canis,

abdomine maculis lateralibus canis apice rufescente, alis violaceo-nigricantibus.

Male. Blackish-cinereous, hoary beneath. Face bright ferruginous. Epistoma with six white bristles. Antennæ and legs black. Thorax with four hoary stripes. Abdomen with hoary spots along each side; tip reddish; appendages black, ciliated. Wings blackish, with violet reflections. Length of the body 9 lines; of the wings 16 lines.

Gen. DISCOCEPHALA, *Macquart*.

42. DISCOCEPHALA DORSALIS, *Walk.* (See page 9.) mas. Thorace vittis duabus testaceis, abdomine piceo fasciis latis abbreviatis testaceis apice nigro-cupreo, pedibus testaceo-fulvis, femoribus tibiisque apice nigricantibus, femoribus posticis crassis spinosis.

Male. Thorax with two testaceous stripes. Abdomen piceous, with short broad testaceous bands, blackish cupreous towards the tip. Legs testaceous-tawny; femora and tibiæ with blackish tips; hind femora thick, spinose.

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

43. Laphria Reinwardtii, *Wied.* See page 10.

44. Laphria alternans, *Wied.* See page 10.

45. Laphria notabilis, *Walk.* See page 10.

46. Laphria triangularis, *Walk. Cat. Dipt.* 2nd Ser. 3. 553. 138.
Inhabits also Sumatra.

47. Laphria constricta, *Walk. Cat. Dipt.* 2nd Ser. 3. 555. 142.
Inhabits also Sumatra.

48. Laphria aurifacies, *Macq.* See page 10.

49. Laphria inaurea, *Walk.* See page 11.

50. Laphria plana, *Walk.* See page 12.

51. LAPHRIA UNIFASCIA, n. s., mas. Nigro-cuprea aureo-hirta, mystace nigro, abdominis lateribus fasciâ ventrequè rufescentibus, alis nigricantibus basi latè sublimpidis venis nigris, halteribus fulvis.

Male. Blackish cupreous, partly clothed with gilded hairs. Face with very pale gilded tomentum. Mystax with some black bristles. Antennæ black; 3rd joint linear, acuminate, a little longer than the 1st and the 2nd together. Thorax with two bands of gilded tomentum. Abdomen reddish beneath and on each side, and with a very broad reddish band. Legs black, stout, pilose; hind femora very thick. Wings blackish, nearly limpid for one-third of the length from the base. Halteres tawny. Length of the body 5 lines; of the wings 8 lines.

52. LAPHRIA COMPTISSIMA, n. s., mas et fœm. Aureo-tomentosa, facie albo-tomentosâ, antennis pedibusque nigris, abdomine apicem versus nigro-purpureo, tibiis luteis, alis nigricantibus dimidio ferè basali subcinereo, halteribus fulvis apice fuscis.

Male and Female. Body covered with gilded tomentum. Mystax composed of several slender black bristles. Antennæ and legs black. Third joint of the antennæ nearly linear, slightly acuminate, hardly longer than the 1st and the 2nd together. Abdomen bare, shining and blackish-purple towards the tip. Legs rather stout; tibiæ luteous; hind tibiæ black towards the tips. Wings blackish, slightly greyish on nearly half the length from the base; veins black, tawny at the base. Halteres tawny, with brown knobs.

Male. Face with white tomentum.

Female. Face with pale gilded tomentum.

Length of the body $4\frac{1}{2}$ –5 lines; of the wings 8–9 lines.

53. *LAPHRIA RUDIS*, n. s., fœm. Nigra, capite postico pectoreque canotomentosis, facie fulvâ, thorace vittis duabus canis; abdomine cyaneo-nigro maculis lateralibus canis, alis nigricantibus basi latè subcinereis, halteribus fulvescentibus.

Male. Black. Head with hoary tomentum behind, thickly clothed beneath with testaceous hairs. Face tawny. Mystax composed of many black bristles. Thorax with two hoary stripes. Pectus hoary. Abdomen bluish-black, with hoary spots along each side. Legs stout, clothed with hoary and pale testaceous hairs, and with black bristles. Wings blackish, slightly greyish for more than one-third of the length from the base; veins black. Halteres somewhat tawny. Length of the body 6 lines; of the wings 11 lines.

54. *LAPHRIA PRODUCTA*, n. s., mas. Atra vix pilosa, facie aureo-tomentosâ, pectore cano, abdomine longiusculo punctis lateralibus canis, pedibus crassis, alis nigricantibus dimidio ferè basali subcinereo, halteribus testaceis.

Male. Deep black, hardly pilose. Face with pale gilded tomentum. Mystax with very few black bristles. Pectus with hoary tomentum. Abdomen somewhat long, with minute hoary dots along each side. Legs thick, rather short. Wings blackish, greyish for nearly half the length from the base; veins black. Halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 7 lines.

55. *LAPHRIA LEPIDA*, n. s., mas. Nigra aureo-pilosa, facie aureo-tomentosâ, thorace bivittato et bifasciato, abdomine aureo-rufo, pedibus crassis pilosis, alis nigricantibus triente basali subcinereo, halteribus testaceis.

Male. Black, clothed with gilded hairs. Face with gilded tomentum. Mystax with many gilded and with a few black bristles. Third joint of the antennæ linear, conical at the tip, longer than the 1st and the 2nd together. Thorax with two stripes and two bands of gilded tomentum. Pectus gilded. Abdomen with golden-red tomentum. Legs pilose; femora incrassated. Wings blackish, slightly cinereous for full one-third of the length from the base; veins black. Halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

56. *LAPHRIA COMPLETA*, n. s., fœm. Nigra fulvo-pilosa, facie pectoreque aureo-tomentosis, abdominis apice glabro nigro-purpureo, pedibus robustis, alis fuscis triente basali pallidiorè, halteribus testaceis.

Female. Black, clothed with tawny hairs. Face and pectus with gilded tomentum. Mystax with several gilded and with a few black bristles. Third joint of the antennæ elongate-fusiform, longer than the 1st and the 2nd together. Legs hairy; femora slightly thickened. Wings brown, paler towards the base; veins black. Halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

57. *LAPHRIA INCIVILIS*, n. s., fœm. Nigra fulvo-tomentosa, facie subauratâ, pectore cano, abdominis lateribus cano-guttatis, tibiis basi fulvis, alis fusco-cinereis basi pallidioribus, halteribus testaceis.

Female. Black, thinly covered with tawny tomentum, not pilose. Face with slightly gilded tomentum. Mystax with very few black bristles. Pectus hoary. Hind borders of the abdominal segments with a hoary dot on each side. Legs slightly pilose; femora rather stout; tibiæ tawny, black towards the tips. Wings brownish-grey, paler at the base; veins black. Halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

58. *LAPHRIA PARTITA*, n. s., fœm. Nigra, facie albidto-tomentosâ, thorace fusco-tomentosâ, pectore cano, abdomine nigro-purpureo, pedibus fulvis, tarsis tibiis apice genubusque posticis nigris, alis subfuscis aut subcinereis, halteribus testaceis.

Female. Black. Face with whitish tomentum, which is very slightly gilded. Mystax with several bristles of the same hue. Third joint of the antennæ fusiform, as long as the 1st and 2nd together. Thorax thinly covered with brownish tomentum. Pectus hoary. Abdomen purplish-black, with a very slight cupreous tinge; sides with brownish tomentum. Legs tawny; femora moderately stout; coxæ, trochanters, tarsi, tips of the tibiæ and hind knees black. Wings slightly cinereous or with a brownish tinge; veins black. Halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

59. *LAPHRIA INTERRUPTA*, n. s., fœm. Nigra, facie aureo-tomentosâ, thoracis fasciis duabus interruptis pectoreque subaurato-tomentosis, abdomine nigro-æneo maculis tribus lateralibus fulvis, tibiis tarsisque testaceis apice nigris, alis nigricantibus dimidio basali subcinereo, halteribus testaceis.

Female. Black. Face with gilded tomentum. Mystax with a few gilded and very few black bristles. Thorax with two interrupted bands of very pale gilded tomentum, which also covers the pectus. Abdomen blackish-æneous, with three tawny tomentose spots on each side. Femora moderately thick; tibiæ and tarsi testaceous, black towards the tips. Wings blackish, very slightly greyish for half the length from the base; veins black. Halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

60. *LAPHRIA CINGULIFERA*, n. s., fœm. Nigra, capite pectore thoracisque fasciis duabus interruptis pallidè aureo-tomentosis, abdominis segmentis apud margines posticos aurato-tomentosis, pedibus testaceis, femoribus nigro-vittatis, tibiis posticis apice tarsisque anticis nigris, tarsis posterioribus nigro-cinctis, alis cinereis, halteribus testaceis.

Female. Black. Head and pectus with very pale gilded tomentum. Thorax with two stripes and two interrupted bands of the same hue. Mystax with many pale gilded bristles. Third joint of the antennæ linear, slightly acuminate, very much longer than the 1st and the 2nd together. Ab-

domen with a gilded band on the hind border of each segment. Legs testaceous; femora hardly stout, with black stripes; hind trochanters and fore tarsi black; hind tibiæ with black tips; posterior tarsi with black bands. Wings cinereous; veins black. Halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

61. *LAPHRIA DETECTA*, n. s., mas. Atræ, capite postico pectoreque albidotomentosis, thorace maculâ laterali pallidè aureo-tomentosâ, abdomine basi albo piloso maculis tribus lateralibus aurato-tomentosis, pedibus fulvis, femoribus nigro-vittatis, tarsis nigris basi fulvis, alis limpidis dimidio fere apicali nigricante.

Male. Deep black. Head behind and pectus with whitish tomentum. Mystax with very few black bristles. Third joint of the antennæ nearly linear, elongate-conical towards the tip, very much longer than the 1st and the 2nd together. Thorax with a spot of pale gilded tomentum on each side, in front of the base of the wing. Abdomen with white hairs at the base, and with three spots of gilded tomentum on each side. Legs tawny; coxæ and trochanters black; femora rather thick, with black stripes, which are very short on the hind pair; tarsi black, tawny at the base. Wings limpid, blackish for nearly half the length from the tips; veins black, tawny in the limpid part. Halteres very pale yellow. Length of the body $6\frac{1}{2}$ lines; of the wings 11 lines.

Subfam. ASILITES, *Walk.*

Gen. *TRUPANEA*, *Macq.*

62. *Trupanea Amorges*, *Walk. Cat. Dipt.* pt. 2. 391 (*Asilus*); 2nd ser. pt. 3. 612. 102.

63. *TRUPANEA INSERENS*, n. s., mas et fœm. Nigra, fusco-tomentosa, facie pectoreque subauratis, mystace suprâ albidò subtùs nigro, antennis pedibusque nigris, thorace vittis quinque nigris, abdominis segmentis cano interruptè marginatis, alis fuscis.

Male and Female. Black, with brown tomentum. Face and pectus with pale, slightly gilded tomentum. Mystax with some whitish bristles above, and with very few black bristles beneath. Antennæ black; arista as long as the 3rd joint. Thorax with five black stripes. Abdomen rather slender, moderately long; hind borders of the segments with slightly interrupted hoary bands. Legs black; tibiæ ferruginous above, except towards the tips. Wings brown; veins black; 3rd externo-medial vein joining the 4th far from the base. Halteres tawny.

Male. Sexualia moderately large. *Female*. Abdomen attenuated, not stylate. Length of the body 6 lines; of the wings 9–10 lines.

Gen. *ASILUS*, *Linn.*

64. *Asilus Barium*, *Walk.* See p. 14.

65. *ASILUS FLAGRANS*, n. s., fœm. Piceus, capite pectoreque aureo-tomentosis, mystace aureo, antennis fulvis, thorace strigis duabus obliquis lateralibus vittisque duabus aureo-tomentosis, abdominis segmentis testaceo-

marginatis, pedibus fulvis, tibiis posticis femoribusque piceo-vittatis, tarsis posticis nigris, alis luridis triente apicali fusca.

Female. Piceous. Head and pectus with gilded tomentum. Mystax with several gilded bristles. Antennæ tawny; arista as long as the preceding joints together. Thorax with two oblique streaks on each side, and with two stripes of gilded tomentum. Abdomen moderately long, hardly stylate; hind borders of the segments testaceous. Legs tawny; femora and hind tibiæ mostly piceous above; hind tarsi black. Wings lurid; apical third part brown, which colour extends further along the hind border; veins black, tawny at the base; cubital vein forked at a little beyond half its length; hind fork very undulating; 3rd externo-medial vein joining the 4th at some distance from the border. Halteres tawny. Length of the body $5\frac{1}{2}$ lines; of the wings 12 lines.

66. *ASILUS CONTORTUS*, n. s., fœm. Niger, cinereo-tomentosus, facie albidâ, mystace suprâ nigro subtus albido, antennis nigris, thorace vittis duabus nigricantibus, pectore cano, abdomine subaureo piloso segmentis testaceo-marginatis, pedibus ferrugineis, femoribus tibiisque apice tarsisque nigris, alis luridis areolarum apicalium fuscæ discis pallidioribus.

Female. Black, with cinereous tomentum. Face prominent, whitish. Mystax with some black bristles above, and with many whitish bristles beneath. Antennæ black; arista as long as the preceding joints together. Thorax with two indistinct blackish stripes. Pectus hoary. Abdomen with slightly gilded hairs, moderately long, hardly stylate; hind borders of the segments testaceous; tip black, shining. Legs ferruginous; tarsi and tips of the femora and of the tibiæ black. Wings lurid; apical areolets brown, with pale disks; veins black; cubital vein forked at beyond half its length; fore fork angular near its base; hind fork very undulating; 3rd externo-medial vein joining the 4th near the border. Halteres tawny. Length of the body 6 lines; of the wings 13 lines.

Gen. *OMMATIUS*, *Illiger*.

67. *Ommatius Hecale*, *Walk.* See p. 14.

Gen. *LEPTOGASTER*, *Meigen*.

68. *LEPTOGASTER TRICOLOR*, n. s., mas. Piceus, capite albido-tomentoso, thoracis vittis duabus posticè attenuatis pectorisque lateribus testaceis, abdomine nigro fasciis quinque flavis, pedibus flavis, tibiis posticis tarsisque apice nigris, tarsis posticis ferrugineis apice nigris, alis cinereis costâ luridâ, halteribus testaceis.

Male. Piceous. Head with whitish tomentum. Antennæ testaceous towards the base. Thorax with two stripes, which are attenuated hindward, and with the sides of the pectus testaceous. Abdomen black, with five yellow bands. Legs yellow; coxæ and knees black; hind femora striped with black beneath; hind tibiæ with black tips; hind tarsi ferruginous, with black tips. Wings grey, lurid along the costa; veins black. Halteres testaceous. Length of the body 7 lines; of the wings 11 lines.

69. *LEPTOGASTER INUTILIS*, n. s., mas. Niger nitens, pectore cano, pedibus testaceis, femoribus tibiis et tarsorum articulis apice nigris, femoribus

- posticis apices versus nigricantibus annulo subapicali testaceo, alis limpidis venis nigris triente basali infuscatis, halteribus testaceis apice fuscis.
- Male.* Black, shining. Pectus with hoary tomentum. Legs testaceous; tips of the femora, of the tibiæ, and of the joints of the tarsi black; hind femora mostly blackish, with a testaceous subapical band. Wings limpid; veins black, clouded with brown towards the base. Halteres testaceous, with brown knobs. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Fam. LEPTIDÆ, *Westw.*

Gen. LEPTIS, *Fabr.*

70. *Leptis ferruginosa*, *Wied. Auss. Zweifl.* i. 224. 6.
 71. *Leptis decisa*, *Walk.* See p. 15.

Gen. CHRYSOPILA, *Macq.*

72. *CHRYSOPILA MACULIPENNIS*, n. s., mas et fœm. *Picea*, pectore testaceo cano-tomentoso, abdominis segmentis testaceo-fasciatis, pedibus testaceis, alis limpidis, fasciis tribus maculosis fuscis.
- Male and Female.* Piceous. Head in front and pectus with hoary tomentum. Proboscis, legs and halteres testaceous. Antennæ black. Abdomen with a testaceous band on the hind border of each segment. Wings limpid, with three irregular brown bands; 2nd and 3rd bands broad, connected, adorned with several limpid spots; veins black. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Fam. BOMBYLIDÆ, *Leach.*

Subfam. THEREVITES, *Walk.*

Gen. THEREVA, *Latr.*

73. *THEREVA PRÆCEDENS*, n. s., fœm. *Nigra* confertim cano-tomentosa, capite antico albo barbâque albâ, pedibus subpilosis, alis subcinereis venis nigris.
- Female.* Black, entirely covered with hoary tomentum. Head white and shining in front, clothed beneath with white hairs. Proboscis black and shining as usual. Legs slightly hairy. Wings slightly greyish; veins black. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

Subfam. BOMBYLITES, *Walk.*

Gen. ANTHRAX, *Fabr.*

74. *Anthrax Tantalus*, *Fabr. Syst. Antl.* 124. 29.
 Inhabits also Hindostan, Java and China.
75. *Anthrax pennipes*, *Wied. Auss. Zweifl.* i. 272. 23.
 Inhabits also Java.
76. *ANTHRAX SEMISCITA*, n. s. (Group 10. *Dipt. Saund.* 167), mas. *Nigropicea* cinereo nigroque pilosa, abdomine nigro apicem versus argenteo-

micante, alis nigricantibus dimidio apicali obliquè limpidò guttis duabus (unâ anteriore exteriore, alterâ posteriore interiore) nigricantibus.

Very nearly allied to *A. bimacula*, Walk. *Male*. Blackish-piceous, with a few grey and black hairs. Abdomen black, brilliant silvery towards the tip. Wings obliquely blackish for half the length from the base, the blackish part very irregular in outline, and extending to $\frac{3}{4}$ ths of the length of the costa; one blackish dot on the basal angle of the fore fork of the cubital vein, the other on the hind end of the veinlet between the 2nd and 3rd externo-medial veins; veins black. Halteres with whitish tips. Length of the body 4 lines; of the wings 11 lines.

77. *ANTHRAX SATELLITIA*, n. s. (Group 10. *Dipt. Saund.* 167), mas. Atravix pilosa, alis nigricantibus plus triente apicali subobliquè limpidâ guttis tribus discalibus unâque apicali nigricantibus.

Male. Deep black, hardly pilose. Wings blackish, obliquely limpid for more than one-third of the length from the tips; the outline of the blackish part slightly denticulate; the limpid part containing four blackish dots, three discal and one apical, the middle discal dot much larger than the two others. Length of the body 3 lines; of the wings 8 lines.

Fam. DOLICHOPIDÆ, Leach.

Gen. PSILOPUS, Meigen.

78. *Psilopus apicalis*, Wied. *Auss. Zweifl.* ii. 227. 32.

Inhabits also Sumatra.

79. *Psilopus robustus*, Walk. See page 16.

80. *Psilopus tenebrosus*, Walk. See page 16.

81. *PSILOPUS ALLECTANS*, n. s., mas. Lætè cyaneo-viridis, antennarum articulo 3° fulvo, aristâ longissimâ apice albidâ, abdominis segmentis atro-fasciatis, pedibus testaceis, tarsis nigricantibus, alis obscurè fuscis posticè pallidioribus, venis halteribusque nigris.

Male. Bright bluish-green. Proboscis testaceous. Third joint of the antennæ tawny; arista longer than the body, whitish at the tip. Abdomen with deep black bands. Legs testaceous; tarsi blackish, paler towards the base. Wings dark brown, paler along the hind border; veins and halteres black; fore branch of the præbrachial vein nearly straight; discal transverse vein curved outward. Length of the body 3 lines; of the wings 5 lines.

82. *PSILOPUS ALLICIENS*, n. s., mas. Lætè cyaneo-viridis, facie pectoreque argenteo-tomentosis, antennis testaceis, articulo 3° lanceolato, aristâ vix longâ, abdominis segmentis atro-fasciatis, pedibus testaceis, alis sublimpidis, venis halteribusque testaceis.

Male. Bright bluish-green. Face and pectus with silvery tomentum. Proboscis testaceous. Antennæ testaceous; 3rd joint lanceolate; arista black, less than half the length of the body. Abdomen with broad deep black bands, partly æneous towards the tip. Legs testaceous; tarsi darker towards the tips. Wings nearly limpid; veins and halteres testaceous; fore branch of the præbrachial vein much curved; discal transverse vein undulating. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

83. *PSILOPUS ILLICIENS*, n. s., mas. Lætè cyaneo-viridis, antennis nigris articulo 3° brevi, aristâ sat longâ, abdomine lætè viridi segmentis atrofasciatis, pedibus nigris, tibiis fulvescentibus, alis cinereis apud costam fusciscentibus, venis halteribusque nigris.

Male. Bright bluish-green. Proboscis black. Antennæ black; 3rd joint short; arista more than half the length of the body. Abdomen emerald-green, with broad black bands. Legs black; tibiæ dull tawny. Wings grey, brownish along the costa; veins and halteres black; fore branch of the præbrachial vein curved; discal transverse vein undulating. Length of the body 3 lines; of the wings 6 lines.

84. *PSILOPUS DELECTANS*, n. s., mas. Lætè cyaneo-viridis, facie pectoreque argenteo-tomentosis, antennis nigris articulo 3° conico, aristâ sat longâ, abdomine lætè viridi segmentis nigro-fasciatis, pedibus nigris, alis subcinereis, venis halteribusque nigris.

Male. Bright bluish-green. Face and pectus with silvery tomentum. Proboscis black. Antennæ black; 3rd joint conical; arista black, more than half the length of the body. Abdomen bright green, with narrow black bands. Legs black. Wings greyish; veins and halteres black; fore branch of the præbrachial vein curved; discal transverse vein undulating. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

85. *PSILOPUS PROLICIENS*, n. s., fœm. Lætè viridis robustus, capite cyaneo-viridi, facie pectore abdominisque lateribus argenteo-tomentosis, antennis nigris articulo 3° longi-conico, aristâ sat longâ, abdominis segmentis atrofasciatis, pedibus nigris, alis cinereis maculâ costali fuscâ venis nigris, halteribus fulvis.

Female. Bright green, stout. Head bluish-green; face with silvery tomentum. Proboscis black. Antennæ black; 3rd joint elongate-conical; arista full half the length of the body. Thorax with three bright cupreous stripes. Pectus and sides of the abdomen with silvery tomentum. Abdomen with broad deep black bands. Legs black. Wings grey, with an elongated brown spot towards the middle of the costa; veins black; fore branch of the præbrachial vein much curved; discal transverse vein nearly straight. Halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

86. *PSILOPUS PROLECTANS*, n. s., fœm. Lætè cyaneo-viridis, antennis nigris articulo 3° conico, aristâ longissimâ, abdomine apicem versus purpureo, pedibus nigris, alis obscurè fuscis fasciis tribus abbreviatis apiceque sublimpidis, venis halteribusque nigris.

Female. Bright bluish-green. Proboscis black. Antennæ black; 3rd joint conical; arista nearly as long as the body. Abdomen purple towards the tip. Legs black. Wings dark brown, with three nearly limpid bands which do not extend to the costa; 1st band dilated along the hind border to the base of the wing; 2nd very short; 3rd much longer; tips nearly limpid; veins and halteres black; fore branch of the præbrachial vein very much curved; discal transverse vein very deeply undulating, angular, and emitting a short stump in the middle. Length of the body 3 lines; of the wings 6 lines.

87. *PSILOPUS COLLUCENS*, n. s., fœm. Lætè viridi-cyaneus brevis latus, vertice purpureo, facie pectoreque albido-tomentosis, antennis nigris articulo

3° longi-conico, aristâ vix longâ, abdomine lætè viridi segmentis cupreo-fasciatis, pedibus nigris, tibiis testaceis, alis subcinereis, venis nigris, halteribus testaceis.

Female. Bright greenish-blue, short, broad. Vertex purple. Face and pectus with whitish tomentum. Proboscis black. Antennæ black; 3rd joint elongate-conical; arista about half the length of the body. Abdomen bright green, with cupreous bands. Legs black; tibiæ testaceous. Wings greyish; veins black; fore branch of the præbrachial vein very much curved; discal transverse vein almost straight. Halteres testaceous. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

88. *PSILOPUS DERELICTUS*, n. s., mas. Lætè cyaneo-viridis gracilis, metathorace purpureo, abdomine lætè viridi segmentis cupreo-fasciatis, pedibus pallidè flavis, alis sublimpidis venis nigris, halteribus testaceis.

Male. Bright bluish-green, slender. Head wanting. Metathorax purple. Abdomen bright green, with cupreous bands. Legs pale yellow. Wings nearly limpid; veins black; fore branch of the præbrachial vein almost rectangular; discal transverse vein straight. Halteres testaceous. Length of the body $1\frac{3}{4}$ line; of the wings 3 lines.

Gen. *DOLICHOPUS*, Latr.

89. *DOLICHOPUS ELECTUS*, n. s., fœm. Lætè viridis robustus, capite antico albo, antennis pedibusque nigris, thoracis margine æneo, abdomine æneo-viridi maculis lateralibus albo-tomentosis, tibiis spinosissimis obscurè testaceis apice nigris, alis fusco-cinereis venis nigris, halteribus fulvis.

Female. Bright green, stout. Head white in front. Antennæ black; arista rather stout. Thorax æneous in front and on each side. Abdomen dark æneous-green, with spots of white tomentum along each side. Legs black; tibiæ dull testaceous with black tips, very spinose. Wings brownish-grey; veins black; præbrachial vein forming a very obtuse angle, nearly straight from thence to its tip; discal transverse vein straight, upright. Halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

90. *DOLICHOPUS ALLIGATUS*, n. s., mas. Æneo-viridis sat gracilis, capite argenteo, antennis nigris, pectore cano, abdomine obscurè æneo, pedibus fulvis, tibiis subspinosis, tarsis nigricantibus basi fulvis, femoribus posterioribus nigris, mediis apice fulvis, alis fuscis sat latis venis nigris, halteribus fulvis.

Male. Æneous-green, rather slender. Head with silvery-white tomentum. Antennæ black. Pectus hoary. Abdomen dark æneous. Legs tawny; tibiæ slightly spinose; tarsi blackish, tawny at the base; posterior femora black; middle femora with tawny tips. Wings brown, rather broad, darker along the apical half of the costa; veins black; præbrachial vein and discal transverse vein straight. Halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

91. *DOLICHOPUS COLLECTUS*, n. s., mas. Lætè viridi-cyaneus gracilis, facie perangustâ, antennis nigris, abdomine cyaneo-purpureo, pedibus testaceis, tibiis vix spinosis, femoribus posticis nigris, tibiis posticis nigricantibus apice testaceis, alis subcinereis latiusculis apud costam fuscescentibus, halteribus testaceis.

Male. Bright greenish-blue, slender. Face extremely narrow. Antennæ black. Abdomen dark bluish-purple. Legs testaceous; tibiæ hardly spinose; hind femora black; hind tibiæ blackish, with testaceous tips. Wings greyish, rather broad, brownish along the costa; veins black; præbrachial vein hardly curved, forming an almost imperceptible angle at its junction with the discal transverse vein which is nearly straight. Halteres testaceous. Length of the body $1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$ lines.

Gen. DIAPHORUS, *Meigen*.

92. DIAPHORUS DELEGATUS, n. s., fœm. Viridis albido-tomentosus, antennis nigris, abdomine æneo-viridi basi testaceo, pedibus testaceis, tarsis nigris, tibiis posticis fusciscentibus, alis subcinereis venis nigris, halteribus testaceis.

Female. Green, with whitish tomentum. Proboscis and antennæ black. Abdomen æneous-green, testaceous towards the base. Legs testaceous; tarsi black; hind tibiæ brownish. Wings greyish; veins black; præbrachial vein and discal transverse vein almost straight. Halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Fam. SYRPHIDÆ, *Leach*.

Gen. CERIA, *Fabr.*

93. Ceria Javana, *Wied.* See page 17.

Gen. ERISTALIS, *Latr.*

94. Eristalis niger, *Wied.* See page 17.

95. Eristalis arvorum, *Fabr. Syst. Antl.* 235. 14.
Inhabits also Java and China.

96. Eristalis Andræmon, *Walk. Cat. Dipt.* pt. 3. 627.
Inhabits also Hindostan.

Gen. HELOPHILUS, *Meigen*.

97. Helophilus insignis, *Walk.* See page 17.

Gen. MERODON, *Fabr.*

98. MERODON VARICOLOR, n. s., fœm. Atræ, antennis nigris, aristâ testaceâ, thorace postico cinereo, scutello fulvo, abdomine basi fulvo segmentis testaceo-fasciatis, pedibus nigris, alis subcinereis apud costam fuscis venis nigris, halteribus testaceis.

Female. Deep black. Head with hoary tomentum in front. Antennæ black; arista testaceous. Thorax cinereous towards the scutellum, which is tawny. Abdomen with testaceous bands; base tawny. Legs black. Wings slightly greyish, mostly dark brown along the costa; veins black. Halteres testaceous. Length of the body 8 lines; of the wings 12 lines.

Gen. XYLOTA, *Meigen*.

99. Xylota conformis, *Walk.* See page 18.

Gen. *MILESIA*, *Latr.*

100. *Milesia macularis*, *Wied.* See page 18.
101. *Milesia Reinwardtii*, *Wied.* See page 18.
102. *MILESIA ZAMIEL*, n. s., fœm. Atræ, abdomine nigro-cupreo fasciis duabus angustis interruptis flavis, femoribus rufis basi nigris, alis luteis posticè subcinereis maculâ magnâ costali subapicali fuscâ, halteribus fulvis.
- Female.* Deep black. Head shining in front. Proboscis and antennæ black. Abdomen blackish cupreous, shining, with two slender interrupted yellow bands. Legs black; femora red, black at the base. Wings luteous, greyish along the hind border, with a large brown costal subapical spot; veins luteous, brown towards the tips. Halteres tawny. Length of the body 8 lines; of the wings 16 lines.

Gen. *VOLUCELLA*, *Geoff.*

103. *Volucella trifasciata*, *Wied. Auss., Zweifl.* ii. 196. 3.
- Inhabits also Java.

Gen. *BARYTEROCERA*, n. g.

Fœm. Corpus sublineare, compactum. Caput thorace paullo latius; facies plana. Antennæ conspicuæ; articuli 1^{us} et 2^{us} brevissimi; 3^{us} longissimus, dilatatus, subarcuatus; arista nuda, basalis, articulo 3^o non longior. Abdomen subovatum, arcuatum, sessile, thorace paullo brevius et latius. Pedes validi, breviusculi. Alæ breviusculæ; venæ transversæ exteriores rectæ non obliquæ.

Female. Body compact, nearly linear. Head a little broader than the thorax; face flat; epistoma slightly prominent. Proboscis extending a little beyond the epistoma. Antennæ diverging; 1st and 2nd joints very short; 3rd very long, dilated, curved and slightly widened towards the tip; arista bare, seated on the base of the 3rd joint, which it does not exceed in length. Abdomen sessile, arched, nearly oval, a little broader and shorter than the thorax. Legs stout, simple, rather short. Wings somewhat short; exterior transverse veins straight, upright, forming almost right angles with the cubital, præbrachial and externo-medial veins.

104. *BARYTEROCERA INCLUSA*, n. s., fœm. Nigro-cuprea, capite antico albidio, antennis nigris articulo 3^o subtus luteo, thorace pectoreque testaceo bivittatis, abdomine fasciis tribus testaceis, 1^a basali biguttatâ, 2^a interruptâ, 3^a apicali latissimâ trimaculatâ, pedibus testaceis, femoribus posticis apice tibiisque posticis nigris, alis subcinereis maculâ costali fasciâque exterioriore pallidiore fuscis.

Female. Blackish cupreous, shining. Head whitish in front. Antennæ black; 3rd joint luteous beneath. Thorax with a testaceous stripe on each side. Pectus with a testaceous streak on each side. Abdomen with three testaceous bands; 1st basal, entire, dilated on each side, including a blackish-cupreous dot on each side; 2nd interrupted, dilated on each side and connected with the 3rd, which is apical, very broad, and includes three very large blackish cupreous spots. Legs testaceous; hind femora towards the tips and hind tibiæ black. Wings greyish, with a dark brown spot

beyond the middle of the costa, and with a paler incomplete exterior band; veins black, testaceous at the base. Halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

Gen. CITIBÆNA, n. g.

Mas. *Corpus* sublineare, pilosissimum. *Caput* thorace vix latius; facies plana. *Oculi* villosissimi. *Antennæ* breves; articuli 1^{us} et 2^{us} transversi; 3^{us} conicus, longior et paullo latior; arista nuda, basalis, articulo 3^o duplo longior. *Abdomen* thorace multo longius. *Pedes* simplices, sat graciles. *Alæ* sat angustæ; vena transversa exterior inter cubitalem et præbrachialem angulata, ramulum emittens.

Male. Allied to *Chrysochlamys*. Body nearly linear, thickly pilose. Head hardly broader than the thorax; face flat. Proboscis short. Eyes very pubescent. *Antennæ* short; 1st and 2nd joints transverse; 3rd conical, longer and a little broader; arista bare, seated on the base of the 3rd joint, and about twice its length. Abdomen much longer than the thorax. Legs simple, pubescent, rather slender. Wings rather narrow; 1st externo-medial vein curved; transverse vein between it and the præbrachial nearly straight and upright; transverse vein between the cubital and the præbrachial forming an angle which emits a short stump; fore side of the angle straight; hind side curved.

105. CITIBÆNA AURATA, n. s., mas. Cuprea aureo-pubescent, capite aurato, oculis villosis, antennis pedibusque testaceis, thorace bivittato, femoribus basi cupreis, posticis cupreis apice testaceis, alis sublimpidis apice subcinereis, venis halteribusque testaceis.

Male. Cupreous, thickly covered with gilded down. Head with gilded tomentum in front. *Antennæ* testaceous. Eyes very pubescent. Thorax with two stripes of pale tomentum. Abdomen brighter than the thorax. Legs testaceous; anterior femora cupreous at the base; hind femora cupreous, with testaceous tips. Wings nearly limpid, greyish towards the tips; veins testaceous, black towards the tips. Halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

Gen. SYRPHUS, Fabr.

106. *Syrphus ægrotus*, Fabr. *Syst. Antl.* 243. 48. (*Eristalis*.)

Inhabits also Hindostan, Java, and China?

107. *Syrphus alternans*, Macq. *Dipt. Exot.* ii. 89. 7.

Inhabits also Hindostan.

108. SYRPHUS DIVERTENS, n. s., fœm. Chalybæus æneo-varius, capite antico antennis thoracis vittis duabus scutelloque testaceis, abdomine subluteo fasciis tribus strigis sex obliquis vittaque brevi interruptâ apicali nigris, pedibus halteribusque testaceis, tibiis posticis fuscis, alis limpidis.

Female. Chalybeous, partly æneous. Head in front, antennæ, a stripe on each side of the thorax and scutellum testaceous. Abdomen pale luteous, with three black bands on the hind borders of the segments; a black basal forked streak; the two following segments with an oblique black streak on each side, and an apical interrupted black streak. Legs testaceous; hind

tibiæ brown. Wings limpid, rather long; veins black. Halteres testaceous. Length of the body 4 lines; of the wings 9 lines.

109. *SYRPHUS CYATHIFER*, n. s., fœm. Chalybæo-niger, antennis pedibusque fulvis, abdomine maculis sex subtrigonis duabusque minoribus apicalibus fulvis, alis fusco-cinereis, halteribus fulvis.

Female. Chalybeous-black. Head about the eyes and pectus chalybeous. Antennæ tawny. Abdomen with eight tawny spots; 1st, 2nd and 3rd pair large, nearly triangular; 4th smaller, semicircular. Legs tawny. Wings brownish-grey; veins black. Halteres tawny. Length of the body 3 lines; of the wings 6 lines.

Gen. *BACCHA*, *Fabr.*

110. *Baccha Amphithoë*, *Walk. Cat. Dipt.* pt. 3. 549.
Inhabits also Hindostan.

Gen. *ASCIA*, *Megerle.*

111. *Ascia brachystoma*, *Wied. Auss. Zweifl.* ii. 90. 1.
Inhabits also Hindostan.

Fam. *MUSCIDÆ*, *Latr.*

Subfam. *TACHINIDES*, *Walk.*

Gen. *EURYGASTER*, *Macq.*

112. *EURYGASTER SUBFERRIFERA*, n. s., fœm. Nigra cinereo-tomentosa, capite albo, palpis fulvis, thorace vittis quatuor angustis nigris, abdomine fasciis tribus vittaque angustâ nigris, maculis duabus ventre femoribusque ferrugineis, alis subcinereis.

Female. Black, with cinereous tomentum and long black bristles. Head white in front and about the eyes; frontalia black, nearly linear; facialia without bristles; epistoma not prominent, with a stout bristle on each side. Eyes pubescent. Palpi tawny. Antennæ extending to the epistoma; 3rd joint linear, rounded at the tip, full four times the length of the 2nd; arista slender, very much longer than the 3rd joint. Thorax with four slender incomplete black stripes. Abdomen obconical, hardly longer than the thorax, with three black bands and with a slender black stripe; a large ferruginous spot on each side of the 2nd segment; underside mostly ferruginous. Legs black; femora ferruginous. Wings greyish; veins black; præbrachial vein forming a somewhat rounded but hardly obtuse angle at its flexure, from whence it is nearly straight to its tip; discal transverse vein slightly curved inward near its hind end, parted by less than its length from the border and from the flexure of the præbrachial. Alulæ greyish. Length of the body 3 lines; of the wings 6 lines.

Gen. *MEGISTOGASTER*, *Macq.*

Corpus angustum, cylindricum. *Facies* obliqua. *Facialia* non setosa. *Antennæ* longæ; articulus 3^{us} linearis, 2^o sextuplò longior; arista nuda, gracilis, articulo 3^o paullò longior. *Pedes* longiusculi, setosi. *Alæ* angustæ.

Megistogaster, *Macq. Mém. Soc. Sci. Nat. de Lille*, 1850, 185.

Body narrow, cylindrical, slightly setose. Face slightly retracted and oblique; epistoma not prominent; facialia without bristles. Antennæ very long; 3rd joint nearly linear, six times the length of the 2nd; arista bare, slender, a little longer than the 3rd joint. Legs setose, rather long. Wings narrow; præbrachial vein forming an obtuse angle at its flexure, nearly straight from thence to its tip, joining the costal at somewhat in front of the tip of the wing; discal transverse vein undulating, parted by about half its length from the border and from the flexure of the præbrachial. Type. *Tachina Diabolus*, *Wied.*

113. *Megistogaster Imbrassus*, *Walk. Capt. Dipt.* pt. 4. 781. (*Tachina*).
Inhabits also China.

The female has silvery-white tomentum in front of the head.

Subfam. DEXIDES, *Walk.*

Gen. DEXIA, *Meigen*.

114. *DEXIA MUNDA*, n. s., mas. Viridis, capite cano, frontalibus atris, oculis nudis, antennis pedibusque nigris, abdomine nigro albo-tomentoso fasciis duabus latissimis interruptis apiceque testaceis, alis fuscis, halteribus testaceis.

Male. Green, shining. Head with hoary tomentum in front and beneath, and with gilded tomentum along the eyes above; frontalia deep black, widening in front; facialia without bristles; epistoma not prominent. Eyes bare. Proboscis and palpi testaceous. Antennæ black; 3rd joint elongate; arista pubescent. Pectus and sides of the thorax with whitish tomentum. Abdomen black, shining, oblanceolate, about twice the length of the thorax, armed with several very stout spines; segments with whitish reflections, and with two very broad interrupted testaceous bands; tip testaceous. Legs black. Wings brown; veins black; præbrachial vein emitting a branch at its flexure which forms an almost right angle, from whence it is indistinctly undulating to its tip, which joins the costal at somewhat in front of the tip of the wing; discal transverse vein undulating, parted by less than half its length from the border, and by more than half its length from the flexure of the præbrachial. Alulæ slightly greyish. Halteres testaceous. Length of the body 6 lines; of the wings 8 lines.

115. *DEXIA EXTENDENS*, n. s. (gen. *Thelaira*, *Desv.*), fœm. Atræ, capite cano-tomentoso, vertice cervino, palpis antennisque ferrugineis, thorace vittis tribus fasciisque testaceo-tomentosis, scutelli apice testaceo, abdomine fasciis duabus latis albido-tomentosis, pedibus piceis, femoribus fulvis, alis nigro-fuscis posticè cinereis, halteribus fulvis.

Female. Deep black. Head with hoary tomentum; vertex with fawn-coloured tomentum; frontalia broad; epistoma, proboscis and palpi ferruginous. Antennæ ferruginous, much shorter than the face; arista plumose. Thorax with three stripes and one hinder band of testaceous tomentum; scutellum testaceous at the tip. Pectus with whitish tomentum. Abdomen with some stout bristles, and with two broad bands of whitish tomentum,

the fore one interrupted. Legs piceous; femora tawny. Wings blackish-brown, dark cinereous along the hind border; veins black, tawny at the base; præbrachial vein emitting a short branch at its flexure which forms a slightly acute angle from whence the vein is curved to its tip, and joins the costal at somewhat in front of the tip of the wing; discal transverse vein undulating, parted by hardly half its length from the border, and by rather less than its length from the flexure of the præbrachial. Alulæ cinereous. Halteres tawny. Length of the body $5\frac{1}{2}$ lines; of the wings 12 lines.

Subfam. SARCOPHAGIDES, *Walk.*

Gen. CYNOMYIA, *Desv.*

116. CYNOMYIA FORTIS, n. s., mas. Lætè cyaneo-viridis, capite testaceo-tomentoso, frontalibus nigris, palpis antennisque ferrugineis, abdomine cyaneo, pedibus nigris, alis fusco-cinereis, halteribus fulvis.

Male. Bright bluish-green, with black bristles. Head with shining testaceous tomentum; frontalia black, widening in front. Proboscis, palpi and antennæ pale ferruginous; 3rd joint of the antennæ very long; arista deeply plumose. Abdomen blue. Legs black, stout, very pilose. Wings brownish-grey, darker along the costa beyond the middle; veins black, ferruginous at the base. Halteres tawny. Length of the body 7 lines; of the wings 12 lines.

Gen. SARCOPHAGA, *Meigen.*

117. *Sarcophaga aliena*, *Walk.* See page 22.

118. SARCOPHAGA INDICATA, n. s., mas. Nigra, capite albo-tomentoso, frontalibus atris, thoracis vittis quatuor interlineatis pectoreque canis, abdomine apicem versus subferrugineo e maculis excavatis albidis quadrifariam tessellato, alis subcinereis, halteribus fulvis.

Male. Black. Head with shining white tomentum; frontalia deep black, linear, rather broad. Antennæ black. Thorax with four hoary stripes, which are interlined with black. Pectus hoary. Abdomen with a ferruginous tinge, which is most apparent towards the tip, distinctly tessellated with four rows of excavated whitish spots. Wings greyish; veins black; præbrachial forming an acute angle at its flexure, near which it is very much curved inward, and is thence straight to its tip; discal transverse vein slightly undulating, parted by less than its length from the border, and by much less than its length from the flexure of the præbrachial. Alulæ grey. Halteres tawny. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Subfam. MUSCIDES, *Walk.*

Gen. IDIA, *Meigen.*

119. *Idia discolor*, *Fabr. Syst. Antl.* 295. 55. (Musca.)

Inhabits also Java.

120. *IDIA BIVITTATA*, n. s., fœm. Rufa subtùs testacea, capite antico nigro, thorace vittis duabus nigris, abdomine suprâ nigro vittâ brevi anticâ rufâ, pedibus testaceis, tarsis anticis nigris basi albidis, alis fusco-cinereis.

Var. β. Thorace nigro vittis duabus canis, abdominis dorso toto nigro.

Female. Red, testaceous beneath. Head black in front. Antennæ pale red. Thorax with two black stripes. Abdomen above black, with a short red stripe on the anterior part. Legs testaceous; fore tarsi black, whitish towards the base. Wings brownish-grey, darker along the costa towards the base; veins black. Halteres testaceous.

Var. β. Thorax black, with two hoary stripes. Abdomen wholly black above. Length of the body 3 lines; of the wings 5 lines.

Gen. *MUSCA*, *Linn.*

121. *Musca flaviceps*, *Macq.* See page 23.

122. *Musca chalybea*, *Wied. Auss. Zweifl.* ii. 402. 30.

Inhabits also Java.

123. *Musca micans*?, *Fabr. Syst. Antl.* 291. 38 (genus *Silbomyia*, *Macq.*).

Inhabits also Hindostan, Sumatra and Java.

This is certainly the *S. micans* of Macquart, but does not quite agree with the descriptions of Fabricius and of Wiedemann.

124. *Musca trita*, *Walk.* See page 24.

125. *Musca diffidens*, *Walk.* See page 26.

126. *MUSCA EXEMPTA*, n. s. (n. subgen. allied to *Pyrellia*, *Desv.*), fœm. Lætè viridis, palpis antennisque nigris, abdominis disco purpureo, pedibus piceis, alis subcinereis basi fuscis, venis præbrachiali et cubitali conjunctis.

Female. Bright green. Palpi and antennæ black. Disk of the abdomen purple. Legs piceous; femora darker than the tibiæ. Wings slightly greyish, brown at the base and along nearly half the length of the costa; veins black; præbrachial vein curved, not angular, joining the cubital vein near the tip of the latter; discal transverse vein almost straight, parted by less than its length from the border, and by more than its length from the flexure of the præbrachial. Alulæ lurid. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

127. *Musca domestica*, *Linn. Syst. Nat.* ii. 990.

Inhabits also Europe and some parts of Africa, Asia, and America.

Gen. *BENGALIA*, *Dev.*

128. *Bengalia Dioclea*, *Walk. Cat. Dipt.* pt. 4. 869 (*Musca*).

Subfam. *ANTHOMYIDES*, *Walk.*

Gen. *ARICIA*, *Macq.*

129. *Aricia patula*, *Walk.* See page 28.

This may perhaps be a variety of *Anthomyia quadrata*, *Wied. Auss. Zweifl.* ii. 428. 14.

The latter inhabits Java.

130. *ARICIA INAPERTA*, n. s., mas et fœm. Testacea, capite suprâ et thoracis disco nigris, orbitis albis, pedibus testaceis, alis cinereis apud costam obscurioribus venis nigris basi fulvis. *Fœm.* Abdominis disco nigro.

Male and Female. Testaceous. Head above and disk of the thorax black. Abdomen shining. Eyes bordered with white tomentum. Legs testaceous. Wings grey, darker along the costa; veins black, tawny at the base; discal transverse vein undulating, slightly oblique, parted by less than its length from the border, and by much more than its length from the præbrachial transverse vein. *Female.* Disk of the abdomen black. Length of the body 3 lines; of the wings $5\frac{1}{2}$ lines.

Gen. *ANTHOMYIA*, *Meigen*.

131. *ANTHOMYIA ILLOCATA*, n. s., fœm. Albida, capite albo, maculâ verticis subquadratâ nigrâ; thorace fasciâ nigrâ, abdomine e maculis nigris trivittato, alis sublimpidis.

Closely allied to *A. tonitru*, Wied. *Female.* Whitish, with black bristles. Head white. Frontalia with a black subquadrate spot in front. Proboscis and legs black. Thorax with a black band in front of the wings. Abdomen with three rows of black spots; the middle spots lanceolate, the lateral triangular. Wings nearly limpid; veins black, testaceous at the base; discal transverse vein slightly curved and oblique, parted by much less than its length from the border, and by much more than its length from the præbrachial transverse vein. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. *CÆNOSIA*, *Meigen*.

132. *Cænusia macularis*, *Wied. Auss. Zweift. ii. 438. 2.*

Inhabits also Hindostan.

133. *CÆNOSIA INSURGENS*, n. s., fœm. Nigra cinereo-tomentosa, orbitis albis, antennis testaceis, abdomine e maculis nigris trivittato, alis limpidis, halteribus pallidis.

Female. Black, with cinereous tomentum. Head white about the eyes. Antennæ dull testaceous. Abdomen with three black spots on each side. Wings limpid; veins black, testaceous at the base; discal transverse vein parted by full its length from the border and by nearly twice its length from the præbrachial transverse vein. Halteres pale. Length of the body 2 lines; of the wings 4 lines.

Subfam. *HELOMYZIDES*, *Fallen*.

Gen. *HELOMYZA*, *Fallen*.

134. *Helomyza orientalis*, *Wied. Auss. Zweift. ii. 575. 2.* (*Sciomyza*.)

Inhabits also Java.

135. *HELOMYZA FUSCICOSTATA*, n. s., fœm. Fulva, facie orbitisque cano-tomentosis, abdomine nigro basi fulvo, tibiis tarsisque fusciscentibus, alis cinereis apud costam fuscis.

Female. Tawny with black bristles, paler beneath. Head with hoary tomentum about the eyes and in front. Abdomen black, tawny at the base. Tibiæ and tarsi brownish. Wings grey, brown along the costa; veins black,

tawny at the base ; discal transverse vein oblique, hardly undulating, parted by full half its length from the border and by less than twice its length from the præbrachial transverse vein. Halteres testaceous, with darker knobs. Length of the body $3\frac{1}{2}$ lines ; of the wings 7 lines.

136. *HELOMYZA ÆQUATA*, n. s., fœm. Ferruginea, facie cinereo-tomentosâ, antennis fulvis, scutelli apice pectoreque nigricantibus, abdomine nigro, pedibus piceis, alis luridis posticè cinereis.

Female. Ferruginous, with black bristles. Head with cinereous tomentum in front. Antennæ tawny. Scutellum towards the tip and pectus blackish. Abdomen black. Legs piceous. Wings lurid, grey along the hind border ; veins tawny ; discal transverse vein straight, oblique, parted by less than its length from the border, and by much more than twice its length from the præbrachial transverse vein. Halteres testaceous. Length of the body $2\frac{1}{2}$ lines ; of the wings 5 lines.

137. *HELOMYZA LIMBATA*, n. s., fœm. Pallidè fulva, thorace abdomineque latè nigro-vittatis, pedibus testaceis, alis cinereis.

Female. Pale tawny, with black bristles, testaceous beneath. Arista black, deeply plumose. Thorax and abdomen with a broad black stripe. Legs testaceous. Wings grey ; veins black, tawny at the base ; discal transverse vein parted by much less than its length from the border, and by more than twice its length from the præbrachial transverse vein. Length of the body 2 lines ; of the wings 4 lines.

138. *HELOMYZA PROVICTA*, n. s., fœm. Fulva, orbitis albidis, pedibus testaceis, tarsis obscurioribus, alis luridis posticè cinereis apice fuscis.

Female. Tawny, testaceous beneath. Head whitish about the eyes. Arista black, with long hairs. Legs testaceous ; tarsi darker. Wings lurid, grey along the hind border, brown at the tips and along the adjoining part of the costa ; veins tawny, black in the brown part and along the costa ; discal transverse vein clouded with brown, parted by half its length from the border, and by twice its length from the præbrachial transverse vein. Length of the body $2\frac{1}{2}$ lines ; of the wings 5 lines.

139. *HELOMYZA INVICTA*, n. s., fœm. Fulva, abdominis segmentis nigro-fasciatis, pedibus testaceis, alis cinereis dimidio apicali anticè fusco venâ discali transversâ fusco-nebulosâ.

Female. Tawny, testaceous beneath. Arista black, with long hairs. Abdomen with a blackish band on the hind border of each segment. Legs testaceous. Wings grey, brown on half the breadth behind the apical half of the costa ; discal transverse vein clouded with brown, almost straight and upright, parted by its length from the border, and by more than twice its length from the præbrachial transverse vein. Length of the body 2 lines ; of the wings 4 lines.

Gen. *SAPROMYZA*, *Fallen.*

140. *Sapromyza biguttata*, *Macq. Dipt. Exot.*
Inhabits also Java.

Gen. *GAUZANIA*, n. g.

Fœm. *Corpus* gracile, setosum, subcylindricum. *Oculi* nudi. *Antenna*

breves; articulus 3^{us} longè conicus; arista plumosa. *Abdomen* oblan-
ceolatum, thorace angustius, vix longius. *Pedes* non setosi. *Alæ* angustæ,
venis parallelis.

Female. Body slender, bristly, nearly cylindrical. Eyes bare. Antennæ short;
3rd joint elongate-conical; arista deeply plumose. Abdomen oblanceolate,
shining, narrower but very little longer than the thorax. Legs not bristly.
Wings narrow; præbrachial vein parallel to the cubital; discal transverse
vein straight, parted by about its length from the border, and by much more
than twice its length from the præbrachial transverse vein.

141. *GAUZANIA DEVECTA*, n. s., fœm. Nigra obscura, abdomine nitente, pe-
dibus piceis, alis nigricantibus posticè pallidioribus, halteribus albidis.

Female. Black, dull. Abdomen shining. Legs piceous; femora darker than
the tibiæ. Wings blackish, paler along the exterior border; veins black.
Halteres whitish. Length of the body $1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$ lines.

Subfam. LAUXANIDES, *Walk*.

Gen. LAUXANIA, *Latr*.

142. *Lauxania eucera*, *Walk*. See page 29.

Gen. CELYPHUS, *Dalman*.

143. *Celyphus scutatus*, *Wied. Auss. Zweifl.* ii. 601. 2.

Inhabits also Hindostan and the Philippine Islands.

Subfam. ORTALIDES, *Haliday*.

Gen. LAMPROGASTER, *Macq*.

144. *Lamprogaster zonata*, *Walk*. See page 30.

145. *Lamprogaster glabra*, *Walk*. See page 30.

"On decaying timber," *Wallace MSS*.

146. *LAMPROGASTER BASILUTEA*, n. s., mas. Nigra, capite apud oculos vittis-
que duabus anticis testaceis, antennis piceis, thorace vittis quatuor pallidè
flavis, abdomine fasciis duabus pallidè flavis posticè interruptâ, femoribus
apice rufescentibus, tarsis albis apice nigris, alis cinereis fusco subnebulosis
basi anticè luteis, halteribus testaceis.

Male. Very nearly allied to *L. zonata*, and perhaps the male of that species.
Black, shining. Head testaceous about the eyes, and with two testaceous
stripes in front. Antennæ piceous. Thorax with four pale yellow stripes,
one on each side in front of the wings, and one on each side of the scutum.
Abdomen with two slender pale yellow bands, the hind one interrupted. Fe-
mora reddish at the tips; tarsi white, with black tips. Wings grey, partly
and very slightly clouded with brown, luteous along the basal part of the
costa; veins black, tawny towards the base and along the costa; discal
transverse vein like that of *L. zonata*. Halteres testaceous. Length of
the body 3 lines; of the wings 6 lines.

147. *LAMPROGASTER DIVISA*, n. s., fœm. Nigra, tibiis testaceis nigro-fas-
ciatis, tarsis albis apice nigris, alis nigricantibus guttis plurimis fasciâque
interlineatâ limpidis, halteribus pallidis.

Female. Black. Abdomen shining. Tibiæ testaceous, with black bands; tarsi white, with black tips. Wings blackish, with numerous limpid dots, and with a limpid band which includes the discal transverse vein, and is intersected by an interrupted blackish line. Halteres pale. Length of the body 2 lines; of the wings 4 lines.

148. *LAMPROGASTER PUNCTATA*, n. s., mas. Nigra, capite antico testaceo, orbitis albidis, antennis halteribusque testaceis, pectore vittis duabus testaceis, pedibus piceis, alis nigro-fuscis guttis decem discalibus luridis guttâque apicali albâ.

Male. Black, slightly shining. Head very shining in front, testaceous about the mouth, whitish about the eyes. Antennæ testaceous. Pectus with a testaceous stripe on each side. Legs piceous. Wings blackish-brown, with about ten lurid dots on each, and with a larger white dot on each tip. Halteres testaceous. Length of the body $1\frac{3}{4}$ line; of the wings 3 lines.

149. *LAMPROGASTER GUTTATA*, n. s., mas. Nigra, orbitis albidis, epistomate antennis halteribusque testaceis, pectore vittis duabus vix determinatis testaceis, pedibus piceis, alis nigro-fuscis guttis plurimis apicibusque limpidis.

Male. Black, slightly shining. Head very shining in front, testaceous about the epistoma, whitish about the eyes. Antennæ testaceous. Pectus with an indistinct testaceous stripe on each side. Legs piceous. Wings blackish-brown, with many limpid dots, the largest on the hind border; tips limpid. Halteres testaceous. Length of the body $1\frac{1}{2}$ line; of the wings $2\frac{1}{2}$ lines.

The two preceding species may perhaps form a new genus, the peculiar characters of *Lampromyia* being hardly conspicuous in them.

Gen. SOPHIRA, Walk.

150. *SOPHIRA CONCINNA*, n. s., fœm. Testacea, frontibus luteis, thorace fasciis duabus lateralibus vittisque duabus nigricantibus, pectore ex parte abdominisque vittis quatuor nigris, tibiis posticis fusciscentibus, alis obscure fuscis apices versus pallidè fuscis strigis basalibus fasciâque abbreviatâ limpidis.

Female. Testaceous, shining. Head with luteous frontalia. Thorax with two blackish stripes, and on each side with two blackish bands. Pectus partly black. Abdomen with four black stripes. Hind tibiæ brownish. Wings dark brown, pale brown on the apical third part, with limpid basal streaks, and with a limpid slightly abbreviated band beyond the middle; veins black. Length of the body 3 lines; of the wings 6 lines.

Gen. RIOXA, Walk.

151. *RIOXA lanceolata*, Walk. See page 35. This species is very variable in the breadth of the stripes of the thorax, and in the number and size of the spots on the wings.

152. *RIOXA CONFINS*, n. s., fœm. Ferruginea, abdomine nigricante, alis nigro-fuscis basi guttis octo limpidis.

Female. Ferruginous. Abdomen blackish. Wings blackish-brown, limpid towards the base, with three triangular limpid spots on the costa, with two limpid spots (one of them double) on the hind border, and with two on the disk; veins black. Length of the body 3 lines; of the wings 6 lines.

Gen. DACUS.

153. *Dacus æneus*, *Wied. Auss. Zweifl.* ii. 513. 2.

Inhabits also Java.

154. *DACUS DETERMINATUS*, n. s., mas. Nigro-æneus, capite antennis pedibusque fulvis, thorace vittis tribus albidis duabusque fulvis, abdomine ferrugineo basi nigro, tibiis anticis tarsisque fuscis, alis sublimpidis apice fasciisque duabus fuscis.

Male. Æneous-black. Head and antennæ tawny. Thorax with three whitish stripes and with two tawny stripes; the latter are united at the tip of the scutellum, and the whitish bands extend obliquely on each side to the pectus. Abdomen ferruginous, black above at the base. Legs tawny; tips of the femora darker; posterior femora minutely spinose beneath; tarsi and fore tibiæ brown. Wings nearly limpid, brown from the discal transverse vein to the tips, and with two brown bands; 1st band very imperfect; 2nd very pale and diffuse on the hind half of the wing. Halteres whitish. Length of the body $4\frac{1}{2}$ lines; of the wings 7 lines.

155. *DACUS FIGURATUS*, n. s., fœm. Niger, capite antennis pedibusque fulvis, vertice nigro, thorace vittis tribus (intermediâ quadriramosâ) pectoreque testaceis, abdomine vittâ anticâ fasciâque luteis, tibiis tarsisque posterioribus fuscis, alis subcinereis apice fuscis plagâ mediâ costali luridâ, halteribus albidis.

Female. Black, shining. Head and antennæ pale tawny; vertex black. Thorax with three testaceous stripes, the middle one emitting two oblique branches on each side. Pectus with two testaceous stripes. Abdomen with a luteous stripe extending from the base to the middle, where it is united to a luteous band. Legs tawny; posterior tibiæ and tarsi brown. Wings slightly greyish, with a large lurid space along the middle of the costa; tips brown; veins black. Halteres whitish. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. NOEETA, *Desv.*

156. *NOEETA LATIUSCULA*, n. s., mas. Nigra, capite testaceo, thorace cinereo, scutello nitido, tibiis tarsisque albidis, illis fusco-fasciatis, alis nigro-fuscis guttis plurimis limpidis apud costam dilatatis limpidis fusco-fasciatis.

Male. Black. Head testaceous, with white tomentum in front and beneath. Antennæ and halteres testaceous. Thorax with grey tomentum. Scutellum brilliant black. Abdomen shining. Tibiæ and tarsi whitish, the former with brown bands. Wings blackish-brown, with many limpid dots; costal part limpid, somewhat dilated, with transverse brown streaks. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Gen. TRYPETA, *Meig.*

157. *TRYPETA RUDIS*, n. s., fœm. Nigra cinereo-tomentosa, capite thoracis scapulis fasciâ interruptâ scutello abdominis apice pedibusque testaceis, alis sublimpidis fasciis duabus fuscis 1^a posticè abbreviatâ.

Female. Black, with cinereous tomentum. Head testaceous in front and beneath. Antennæ, legs and halteres testaceous. Scapulæ of the thorax,

an interrupted band, scutellum, and tip of the abdomen also testaceous. Wings nearly limpid, with two brown bands, the interior one abbreviated hindward; veins black, testaceous at the base. Length of the body 3 lines; of the wings 5 lines.

Gen. UROPHORA, *Desv.*

158. *UROPHORA FASCIATA*, n. s., fœm. Nigra nitens, capite antennis scapulis scutello abdominis terebrâ pedibusque testaceis, abdomine fasciis duabus albido-tomentosis, femoribus posterioribus piceis, alis nigro-fuscis vittâ latâ subobliquâ limpidâ apicem versus furcatâ et arcuatâ.

Female. Black, shining. Head testaceous, whitish in front and beneath. Antennæ, scapulæ, scutellum, legs and halteres testaceous. Abdomen with two bands of whitish tomentum. Terebra testaceous, long, slender. Posterior femora mostly piceous. Wings blackish-brown, with some paler spots along the costa, and with a broad, slightly oblique limpid stripe, which towards its tip is divided and curved to the hind border. Length of the body 4 lines; of the wings 6 lines.

Subfam. ACHIIDES, *Walk.*

Gen. ACHIAS, *Fabr.*

159. *Achias maculipennis*, *Westw.* See page 36.

There are two specimens of the male of this species, and the petiole with which the head is furnished on each side is much longer in one specimen than in the other, and in the latter is much longer than in the male from Singapore. I am indebted to Mr. Westwood for the correction of an error in page 33, where the female of this species is described by the name of *Themara ampla*.

Subfam. DIOPSIDES, *Walk.*

Gen. DIOPSIS, *Linn.*

160. *Diopsis quinqueguttata*, *Walk.* See page 36.

161. *Diopsis quadriguttata*, *Walk.* See page 37.

162. *DIOPSIS DISCREPANS*, n. s., mas et fœm. Nigra nitens, antennis fulvis, abdomine apud petioli apicem maculis duabus rufis tomento albo plagiatas, pedibus rufescentibus, tarsis testaceis, alis sublimpidis maculâ apud venam transversam præbrachialem fasciâque exteriore fuscis. *Mas.* Oculorum petiolis corpore paullo longioribus aut brevioribus. *Fœm.* Oculorum petiolis corporis dimidio brevioribus.

Male and Female. Black, shining. Antennæ tawny. Abdomen at the tip of the petiole with two red spots, each accompanied by a patch of white tomentum. Legs reddish; tarsi testaceous. Wings nearly limpid, with a brown spot on the præbrachial transverse vein, and with an exterior brown band; veins black. Halteres white.

Male. Petioles of the eyes a little longer or a little shorter than the body.

Female. Petioles of the eyes less than half the length of the body. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Subfam. SEPSIDES, *Walk.*Gen. CALOBATA, *Fabr.*

163. CALOBATA STRENUA, n. s., fœm. Nigra sat valida, capite antico nigro-cyaneo, thorace subcinereo, femoribus mediis flavo unifasciatis posticis flavo bifasciatis, tarsis anticis albis, alis subcinereis fasciâ latâ fuscâ apice subfuscescentibus, halteribus piceis.

Female. Black, rather stout. Head shining, blackish-blue in front, with white tomentum about the eyes. Thorax slightly tinged with grey tomentum. Legs long, slender; middle femora with one yellow band; hind femora with two yellow bands, one of them at the base; fore tarsi white. Wings slightly greyish, with a broad brown band beyond the middle; tips slightly brownish; veins black. Halteres piceous. Length of the body 6 lines; of the wings 8 lines.

164. CALOBATA CEDENS, n. s., fœm. Nigro-cyanea nitens, antennis abdomine pedibusque nigris, pectore plagis duabus albo-tomentosis, femoribus anticis basi testaceis posterioribus testaceis nigro-fasciatis, tarsis anticis albis, alis subcinereis fasciâ fuscâ apice subfuscescentibus.

Female. Blackish-blue, shining. Antennæ, abdomen and legs black. Pectus with a patch of white tomentum on each side. Legs long and slender; fore femora testaceous towards the base; posterior femora testaceous, with blackish bands; fore tarsi white. Wings slightly greyish, with a brown band beyond the middle; tips slightly brownish. Halteres testaceous, with blackish knobs. Length of the body $3\frac{1}{2}$ –4 lines; of the wings 6–7 lines.

Gen. CARDIACEPHALA, *Macq.*

165. CARDIACEPHALA LONGICOLLIS, n. s., mas. Rufo-lutea, capitis maculis duabus facieque nigris, thorace longissimo lanceolato lineis duabus glaucis, abdomine apicem versus nigro, tibiis tarsisque nigricantibus, tarsis anticis basi albis, alis subcinereis apice fuscescentibus, apud costam subluteis.

Male. Reddish luteous. Head with a black spot on each side of the vertex; face black, with white tomentum on each side. Thorax very long, attenuated in front, with a glaucous stripe on each side. Abdomen black towards the tip, not longer than the thorax. Legs long and slender; tibiæ and tarsi blackish; fore tarsi white at the base. Wings slightly greyish, brownish at the tips, and with a luteous tinge along the costa; veins black, tawny towards the base. Length of the body 5 lines; of the wings 7 lines.

Subfam. PSILIDES, *Walk.*Gen. MICROPEZA, *Meigen.*

166. Micropeza fragilis, *Walk.* See page 37.

Gen. NERIUS, *Wied.*

167. Nerius fuscipennis, *Macq.* See page 38.

Gen. TEXARA, *Walk.*

168. Texara compressa, *Walk.* See page 38.

Subfam. GEOMYZIDES, *Fallen.*Gen. GYMNOPIA, *Fallen.*

169. GYMNOPIA ? GUTTICOSTA, n. s., fœm. Nigra nitens, pectoris lateribus canis, thoracis fasciâ abdominisque basi pallidè flavis, tibiis tarsisque ferrugineis, alis subflavescentibus guttâ costali nigrâ.

Female. Black, shining. Head wanting. Thorax with a pale yellow band. Pectus hoary on each side. Abdomen blackish, cupreous towards the base, which is pale yellow. Tibiæ and tarsi ferruginous. Wings slightly yellowish, with a black dot on the costa before half the length; veins yellowish. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

170. GYMNOPIA INFUSA ?, n. s., mas. Nigra, thorace subpubescente, scutello longi-obconico, abdomine æneo-nigro, pedibus halteribusque testaceis, alis limpidis venis nigris.

Male. Black. Head wanting. Thorax slightly pubescent. Scutellum long-obconic. Abdomen æneous-black, shining. Legs and halteres testaceous. Wings limpid; veins black; discal transverse vein parted by more than its length from the border, and by less than twice its length from the præbrachial transverse vein. Length of the body $1\frac{1}{4}$ line; of the wings $2\frac{1}{2}$ lines.

On a New Organ in Insects. By JOHN BRAXTON HICKS, Esq.,
M.D. Lond., F.L.S. &c.

[Read June 17, 1856.]

ABOUT a month since my attention was directed towards a peculiar structure in the *halteres* of the *Rhingia rostrata*, by Mr. Purkiss, who is an energetic and zealous searcher for microscopical objects, and who, from the position and structure of this organ, considered it to be the organ of smell. How far this is probable, I will leave the Society to judge at the termination of this paper. I instantly directed my attention to the subject, and I will endeavour to lay before the Society the results at which I have arrived up to the present time, apologizing for the incompleteness of the investigation, in consequence of my anxiety to bring it before the Society previous to the summer recess.

If we dissect a perfect fly, there will be seen in the centre of the thorax the great thoracic ganglion, which is formed by the fusion of the three thoracic ganglia into one. From thence it will be plainly seen that the first branch passes to the anterior leg; the second (much larger) enters the base of the wing after giving off a few branches to the muscles; the third branch passes

to the middle leg; and the fourth (the largest of all) passes straight into the *halteres*; the fifth set supplying the posterior legs. I have drawn the nerves of the Drone (Plate V. fig. 1) and Blow-fly (fig. 2).

In the *Lepidoptera* there are two thoracic ganglia. The first (the smaller) supplies the anterior legs. The second gives off the first pair to the anterior wings, the second pair to the middle legs, the third pair to the second wings, and the fourth to the posterior legs.

In the *Lucanus Cervus* (*Coleoptera*) we find three thoracic ganglia: the anterior supplies the first pair of legs; the second gives a pair to the elytra and a pair to the middle legs; while the third ganglion supplies a pair to the second wings and the posterior legs.

In the *Orthoptera*, in the Locust for example, the arrangement is similar as to the origin of the nerves.

In the *Hymenoptera* the arrangement is as in the *Lepidoptera*.

In the *Neuroptera* (Dragon-fly) there are three thoracic ganglia, the nerves passing off in the same manner as in the *Lucanus Cervus*.

In the *Hemiptera* the thoracic ganglia are fused into one, as in the Fly. But the nerve to the anterior wing is twice the size of that to the posterior.

From the above statement, it will be seen that we find in all insects—

1st, A pair of nerves going to and entering the base of each of the wings; and in the *Diptera*, of the *halteres* also.

2nd, The nerves supplying the posterior wings or *halteres* are generally the larger.

As there are no muscles in either the wings or *halteres*, these nerves must be sensory.

I shall now describe the curious organs to which they proceed.

And first as regards the *halteres*. Situated on the pleura, and closely adjoining a large spiracle, we find the joint very free, so that these organs can be moved with such rapidity as to render them invisible when in motion; and they are beautifully protected in the Fly by the scales, which in *Rhingia rostrata* form a very beautiful object.

The *halteres* consist of a base, shaft, and head; the relative proportion of each varying in different insects. On each side of the base is a ridge, and on these ridges are situated two similar structures. In the *Rhingia rostrata* (Plate V. fig. 3), for instance,

there are about twenty rows of vesicles, each row separated from the adjoining one by a slight distance. There is a row of hairs between each row of vesicles, the hairs arching over them, and thereby forming a protection from extraneous particles. These hairs are in pairs, one pair being opposite to each vesicle. The rows on the ridge are arranged transversely to the axis of the *halteres* (fig. 3 *a, c*). The vesicles themselves are very transparent, and hemispherical or even more nearly spherical projections, apparently cuticular. This is well seen by a profile view, fig. 3 *e*. Their diameter, in this fly, is about $\frac{1}{4000}$ th of an inch: each vesicle nearly touches its neighbour.

Beneath these, but on one side only, is a broader, flatter face, on which the vesicles are more distinct, and at a farther distance from each other, the rows arranged parallel to the axis of the *halteres*, and only one hair opposite each vesicle, there being some alternate. The diameter of each of these is about $\frac{1}{3700}$ th of an inch. There is a smaller group of vesicles situated on one side of this latter face, in number about ten; the individual vesicles are rather larger.

In the *Tabanidæ* the arrangement is very similar, with the addition of seven vesicles on the shaft of the *halteres*, to the upper part of the facet of the ridge, and another group of eight or nine beneath the ridge opposite the broader facet.

In *Tipula* the same general arrangement holds, except that in the facets on the ridge the vesicles are arranged in a quincuncial manner, and are larger than those on the broad facet, being about $\frac{1}{1900}$ th of an inch, with numerous hairs between each (fig. 4 *a*). The broader facet too is less extensive relatively to the others, and is also quincuncial in arrangement, of the diameter of $\frac{1}{3000}$ th of an inch (fig. 4 *b*). Besides these, in the largest Crane-fly, on the joint, there is a cone, having on its flattened apex a group of about eight or nine vesicles, with numerous very small hairs between them (fig. 4 *c*).

The shaft of the *halteres* is tubular, and through it apparently passes a branch of the nerve, which seems to expand as it reaches the head, and which head contains cellular substance, and has externally a groove on one side, just below its greatest diameter. The membrane lining the groove is apparently very delicate. A group of hairs is generally found at the end of the groove.

I have now described the principal features of these curious structures, as found in the *halteres* of the *Diptera*; none that I have examined have been free from them. The number of vesicles

in each of the *halteres* (in *Rhingia* for instance) is about 120 for each principal face, making for the three faces 360.

Thus we find a nerve, the largest nerve except the optic, entering the *halteres*, where there are no muscles, therefore this nerve must be one of sensation; and I think it will be allowed that it must be one of *special* sensation.

But as there is also a nerve going to the base of the wings, we might expect to find similar structures there, and we shall not be disappointed; for if we look on the subcostal nervure at the base, we shall see a group of vesicles of a similar character to those on the *halteres*,—not so beautifully arranged, but still very distinct, as is clearly shown in the *Tabanidæ* and some *Muscæ* (fig. 5). They extend in a single row some little distance up the nervure, and are found on both sides of the nervure, but principally on the *upper* side.

These organs are not confined to the *Diptera*, but I believe are to be found in all insects; at least I have found them as far as I have examined. They exist on both sides, but principally on the upper side of the base of the subcostal nervure; on the costal nerve in *Hemiptera*. Those on the second wing are generally the largest in number and size; but that, I suspect, is determined by the size of the nerve proceeding to them. In Moths they are very apparent, being greatest in the *Noctuæ* and *Bombycidæ*. There are about 100 vesicles on the upper surface of the posterior wing, and half that number beneath, besides some few on the nervures. (See fig. 7 *b*.) In the Butterfly they are smaller, but arranged in more definite groups, about three in number. In *Coleoptera* and *Neuroptera* they are arranged in long rows along the subcostal nerve; they are more apparent in *Coleoptera* than in *Neuroptera*. In the *Hymenoptera*, for instance the Bee, they are found in a rounded group of about forty on each side (fig. 6 *a*).

In a subsequent paper I hope to show a more extended analysis of this structure in the different tribes of Insects.

Now, what is the nature of these organs? Are they organs of smell, as suggested by Mr. Purkiss? As the olfactory organ has never yet been decided on, it seems to me not improbable that they may be the organs of that sense; for, first, it is not likely that they should be the organ of hearing, as they are in constant motion, and situated near the source of the hum of the wings, so that other sounds would be drowned. 2ndly. It is not necessary that the power of smell should be in the head. It is situated in

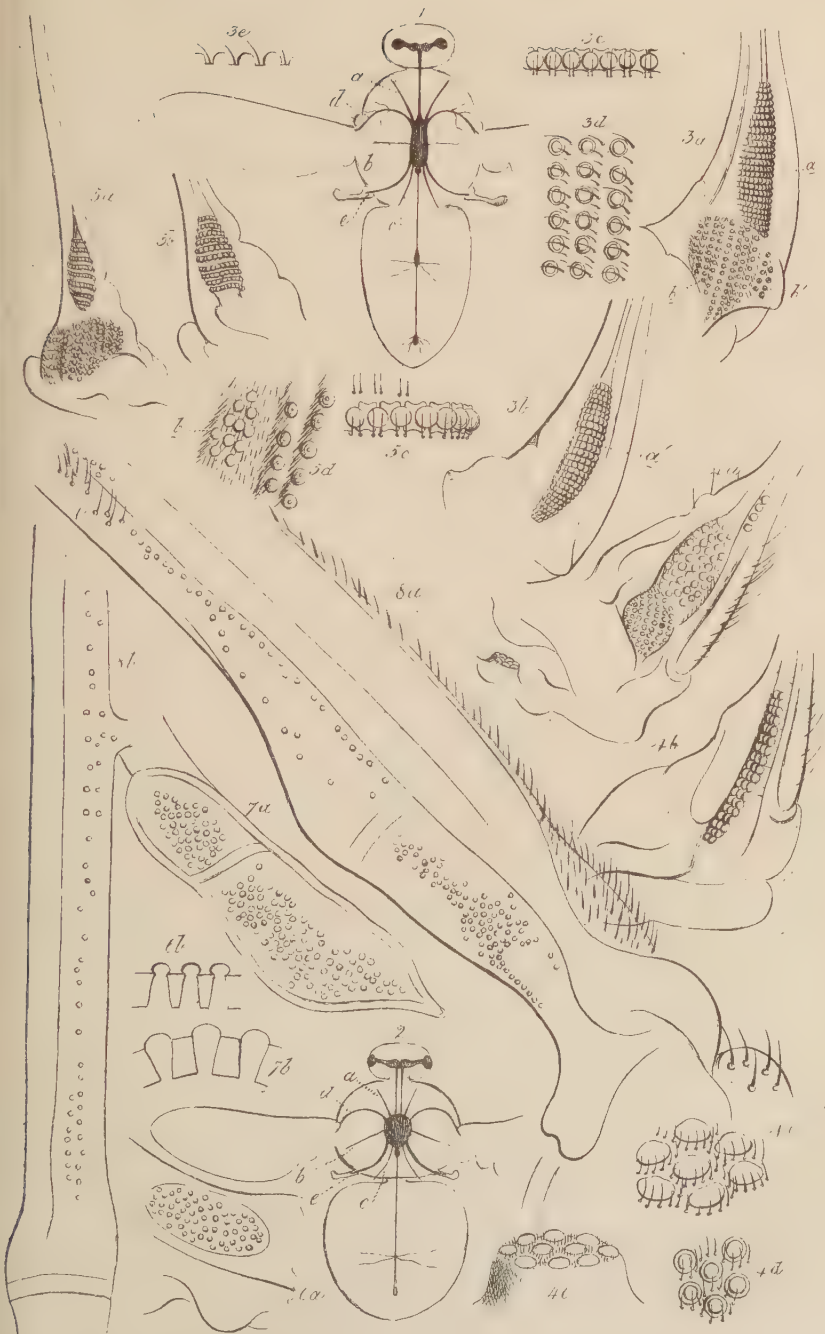
the commencement of the air-passages in the upper animals, probably because the current of air or water passing the olfactory nerves is there most powerful; but in the spiracle-breathing insect the greatest currents are in the neighbourhood of the wing, and near the greatest thoracic spiracle. The motion of the *halteres* also permits a greater exposure to odours floating in the air.

That the olfactory nerves should be necessarily, and by analogy, always before the optic, will not hold good below Fishes, where they first appear in that position. Otherwise the auditory apparatus in *Crustacea* ought to be behind the optic. In fact, there is no known analogy on this point, as no olfactory organs have yet been described below *Vertebrata*. Besides, if there are no nerves in front of the optic except those to the mouth and antennæ, either these latter must be olfactory organs, or the olfactory organs must be sought for elsewhere behind.

It may be added, that the respiratory apparatus is diffused (as are the nervous centres), and not connected with the oral or nasal aperture; and although the sensations be the same, analogy forms no sort of argument that the organs of sensation should always occupy precisely the same place.

DESCRIPTION OF PLATE V.

- Fig. 1.* Nervous system of the Drone-fly (*Eristalis tenax*): *a*, nerve of first leg; *b*, nerve of second leg; *c*, nerve of third leg; *d*, nerve of wing; *e*, nerve of one of the halteres.
- Fig. 2.* Nervous system of Blow-fly (*Musca vomitoria*); nerves lettered as above.
- Fig. 3.* Details of *Rhingia rostrata*; *3 a*, base of one of the halteres: *a*, group of vesicles on ridge; *b*, ditto on the broad facet; *b'*, a group of larger vesicles on the side of *b*. *3 b*, base of one of the halteres, another view, showing, *a'*, group of vesicles on the other ridge; *3 c*, magnified vesicles of the ridge, diameter 4000th of an inch; *3 d*, ditto on broad facet, diameter 3700th of an inch; *3 e*, profile of *3 c*.
- Fig. 4.* Details of the largest Crane-fly (*Tipula oleracea*?): *4 a*, base of one of the halteres; *4 b*, ditto, another view; *4 c*, several of the vesicles on the ridge, diameter 1900th of an inch; *4 d*, ditto on broad face, diameter 3000th of an inch; *4 e*, ditto on the conical lobe at the junction of the halteres with the body.
- Fig. 5.* Details of Blow-fly (*Musca vomitoria*): *5 a*, base of one of the halteres; *5 b*, another view of ditto; *5 c*, vesicles on the ridge, diameter 2720th of an inch; *5 d*, ditto on the broad facet with the small lateral group, diameter 3730th of an inch.
- Fig. 6.* Details of Bee (*Andrena Mouffetella*): *6 a*, dorsal view of the vesicles on the costa of the hind wing; *6 b*, section of ditto.
- Fig. 7 a*, Subcostal nervure of the *Ermine Moth*, upper side; *7 b*, section of ditto.
- Fig. 8 a*, Base of anterior wing of *Leptis scolopacea*, showing the base of the subcostal nervure on the upper side; *8 b*, ditto on the under side.



Catalogue of the Homopterous Insects collected at Sarawak, Borneo, by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER, Esq., F.L.S. &c.

[Read January 20th, 1857.]

Ord. **CICADINA**, *Burmeister*.

Fam. **STRIDULANTIA**, *Burm.*

Gen. **PLATYPLEURA**, *Amyot et Serv.*

1. *Platypleura semilucida*, *Walk.* See page 83.

Gen. **TACUA**, *Amyot et Serv.*

2. *Tacua speciosa*, *Müller* (*Tettigonia*).

Inhabits also Hindostan.

Gen. **DUNDUBIA**, *Amyot et Serv.*

3. *Dundubia immacula*, *Walk. Cat. Homopt.* pt. 1. 50.

Inhabits also Tenasserim.

4. *Dundubia phæophila*, *Walk. Cat. Homopt.* pt. 1. 52.

Inhabits also Corea.

5. *Dundubia Thalia*, *Walk. Cat. Homopt.* pt. 1. 72.

6. *Dundubia intemerata*, *Walk.* See p. 84.

7. **DUNDUBIA DECEM**, n. s., fœm. Ferrugineo-lutea lata, mesothoracis scuto viridi, scutello fasciâ latâ interruptâ nigricante, abdominis segmentis nigro marginatis, tibiis suprâ tarsisque nigris, alis vitreis; anticarum areolis marginalibus fuscescente vittatis, venis viridibus nigro variis, venis transversis apice venulisque transversis nigricante maculatis.

Female. Ferruginous luteous, broad. Scutum of the mesothorax green; scutellum with a broad diffuse blackish band consisting of four parts, and with the apical ridges partly black. Hind borders of the abdominal segments, tibiæ above and tarsi black. Wings vitreous. Fore wings with an indistinct pale brown streak on each marginal areolet; veins green, partly black; transverse veinlets and tips of the marginal veins clouded with blackish-brown. Length of the body 18 lines; of the wings 58 lines.

8. **DUNDUBIA DUARUM**, n. s., mas. Fulva, capite vittis tribus angulosis fasciâque anticâ prothorace vittis quatuor mesothoracis scuto vittis duabus scutelloque vittis quinque nigris, tympanis abdominis apicem attingentibus apices versus nigris, abdominis segmentis testaceo aut viridi marginatis, pedibus nigro variis, alis vitreis, anticarum venis nigris ex parte rufescentibus, venulis transversis 1^a et 2^a nigricante maculatis.

Male. Tawny. Head above with three angular black stripes, and in front with a black band. Prothorax with four black stripes, which are dilated in front. Scutum of the mesothorax green, with a black stripe on each side; scutellum with five black stripes, the inner pair interrupted, the outer pair broad.

Opercula green; drums black towards the tips and along the inner border, extending to the tip of the abdomen. Legs testaceous, femora and tibiæ striped with black; tarsi black; hind tarsi testaceous. Wings vitreous. Fore wings green at the base; veins black, reddish along the costa and towards the base; 1st and 2nd transverse veinlets clouded with blackish-brown. Length of the body 15 lines; of the wings 46 lines.

Gen. FIDICINA, *Amyot et Serv.*

9. *Fidicina Aquila*, *Walk. Cat. Homopt.* pt. 1. 84.

Inhabits also Corea.

Gen. HUECHYS, *Amyot et Serv.*

10. *Huechys splendidula*, *Fabr. Syst. Rhyn.* 42. 49.

Inhabits also Hindostan and Java.

11. *HUECHYS FACIALIS*, n. s., mas. Atra, fronte facie mesothoracisque maculis duabus testaceis, pectoris maculis duabus et segmentorum abdominalium marginibus rufis, alis anticis fuscis, posticis subcinereis.

Male. Deep black, shining. Front and face testaceous. Scutellum of the mesothorax with a very large testaceous spot on each side. Pectus with a red spot on each side. Hind borders of the abdominal segments red. Fore wings brown. Hind wings slightly greyish. Length of the body 9 lines; of the wings 22 lines.

Fam. FULGORINA, *Burm.*

Subfam. FULGORELLÆ, *Spinola.*

Trib. FULGORITES, *Spinola.*

Subtrib. FULGOROIDES, *Spinola.*

Gen. HOTINUS, *Amyot et Serv.*

12. *Hotinus Sultana*, *White, Proc. Zool. Soc. Lond.* 1847, 83; *Ann. Nat. Hist.* xx. 204.

13. *HOTINUS INTRICATUS*, n. s., mas. Ferrugineus, rostro ascendente albo punctato apice luteo corpore vix brevior, abdomine nigro segmentorum marginibus viridibus, tibiis tarsisque nigris, alis anticis viridi-venosis fasciis interioribus testaceis, maculis exterioribus luteis, posticis lætè cyaneo-viridibus, margine latissimo purpurascente nigro.

Male. Ferruginous. Rostrum slightly curved and ascending, sprinkled with white flecks, rounded and luteous at the tip, a little shorter than the body. Abdomen black; hind borders of the segments green. Tibiæ and tarsi black. Fore wings black, with three testaceous interior bands, and with twelve exterior luteous spots; 3rd band interrupted; veins green, brighter on the interior part than on the exterior part, where they are differently arranged. Hind wings bright bluish-green, with very broad purplish-black borders. Length of the body without the rostrum 11 lines; of the wings 33 lines.

This species is closely allied to *H. maculatus*, *Oliv.*, but in the latter species

the rostrum is wholly black and more slender at the tip; the fore wings have green spots and no bands, and the blue part of the hind wings extends more towards the borders in front and less so hindward.

14. *HOTINUS CULTELLATUS*, n. s., mas. Pallidè viridis, rostro compresso subascendente corporis ferè longitudine, abdomine testaceo, alis anticis guttis nonnullis testaceis fusco marginatis, posticis luteis.

Male. Pale green. Rostrum compressed, keeled, hardly ascending, acuminate at the tip, testaceous above, a little shorter than the body. Abdomen and legs testaceous. Fore wings with a few testaceous brown-bordered dots of various size. Hind wings luteous. Length of the body without the rostrum 8 lines; of the wings 28 lines.

Subtrib. *LYSTROIDES*, *Spinola*.

Gen. *APHÆNA*, *Guérin*.

15. *Aphæna scutellaris*, *White*, *Ann. Nat. Hist.* xvii. 330.

16. *Aphæna Saundersii*, *White*. See page 84.

17. *Aphæna basirufa*, *Walk. Cat. Homopt.* pt. 2. 278.

It differs slightly from the three Silhet specimens in the British Museum, which are exactly alike.

18. *APHÆNA SATURATA*, n. s., mas. Nigra, thoracis lateribus ferrugineis, alis anticis viridi-nigris e lineâ transversâ arcuatâ lutescente in areas duas divis, areâ interiore longiore semicirculis rufescentibus ornatâ, exteriore subrotundâ creberrimè luteo-venosis, posticis lineâ rectâ divis, marginis interioris dimidio basali flavo plagiato.

Male. Black. Ferruginous piceous, black beneath. Wings greenish-black, divided into two areas by a transverse line, which is curved and pale luteous in the fore wings, straight and rather darker in the hind wings; interior area longer than the other one, adorned in the forewings with various little luteous half-ringlets which are accompanied by dots, in the hind wings with partly green veins, and with a yellow patch towards the base of the interior border; exterior area nearly round, most thickly crowded with luteous veins; a glaucous bloom covering the interior area on the under side, and forming a semicircle on the exterior one. Length of the body 11 lines; of the wings 30 lines.

This species and *A. rosea*, Guér., are closely allied in structure and in the disposition of the colours, and are distinguished from the two preceding species by their much more ample wings.

19. *APHÆNA VERIS-AMOR*, n. s., mas et fœm. Nigra, facie pedibusque ferrugineis, abdomine rufo, alis anticis saturatè et lætissimè viridibus, costâ lineâ arcuatâ exteriore maculâque basali flavis, subtus tomento albo variis, posticis niveis apice fulvis.

Male and Female. Black. Face and legs ferruginous. Abdomen red. Fore wings intensely grass-green, with the costa, a basal spot, a few dots in the disk, and an exterior curved transverse line yellow; tips tawny; under side with various marks of white tomentum, which also appears on

the costa above at the base. Hind wings snow-white, with tawny tips. Length of the body 11 lines; of the wings 26 lines.

This species has narrow fore wings like *A. scutellaris*, but belongs to a distinct group.

20. *APHÆNA UNIFORMIS*, n. s., fœm. Fusca, capite thorace antico pedibusque fulvis, alis fulvo venosis, anticis basi nigris fasciâ contiguâ flavâ.

Female. Brown. Head, fore part of the thorax and legs tawny. Abdominal segments with red borders. Wings with tawny veins. Fore wings narrow, black at the base, near which there is a yellow band. Length of the body 8 lines; of the wings 22 lines.

This species will form a fourth group in the genus. The veins of the fore wings have the same structure over the whole surface.

Subtrib. DICTYOPHOROIDES, *Spinola*.

Gen. DICTYOPHORA, *Germar*.

21. *Dictyophora spellinea*, *Walk*. See page 84.

22. *DICTYOPHORA SPEICARINA*, n. s., mas. Testacea, capite thoraceque viridi carinatis, capite lanceolato tricarinato subascendente apice fusco, thorace septem-carinato, tibiis tarsisque rufis, alis hyalinis venis fulvis apice fusco nebulosis, stigmatibus fulvo.

Male. Testaceous. Head and thorax with green keels. Head lanceolate, very slightly ascending, with three ridges, brown at the tip, as long as the breadth of the thorax. Thorax with seven ridges, three dorsal and four lateral. Tibiæ and tarsi red. Wings hyaline; veins and stigma tawny; apical transverse veinlets clouded with brown. Length of the body 5 lines; of the wings 12 lines.

Gen. LEUSABA, n. g.

Dictyophoræ affinis. Caput arcuatum, breve, vertice marginato, fronte planâ longi-subquadrata antice latiore, facie lanceolata fronte paullo brevior. Prothorax marginatus, valde arcuatus, margine postico excavato et intus angulato. Mesothorax tricarinatus. Pedes longi. Alæ anticæ extus latiores, areolis basalibus longissimis, discalibus et marginalibus brevioribus, venis marginalibus nonnullis furcatis, venulis transversis costalibus et submarginalibus nullis.

Allied to *Dictyophora*. Head short, arched; vertex with an elevated border, about four times broader than long; front smooth, subquadrate, much longer than broad, slightly widening in front, with two indistinct furrows which converge forwards; face lanceolate, a little shorter than the front. Prothorax much arched, with an elevated border, excavated and much arched on the hind side. Mesothorax with three keels. Legs long. Fore wings widening towards the tips; five basal areolets very long; six discal areolets a little longer than the marginal areolets, the latter numerous, and four of them forked; no transverse costal or submarginal veinlets.

23. *LEUSABA MARGINALIS*, n. s., mas. Viridis, capitis thoracisque marginibus et carinis ex maximâ parte testaceis, thorace guttis nonnullis nigro-fuscis,

alis hyalinis, anticis apud marginem exteriorem fuscis, venis nigris basi fulvis, stigmatè fusco.

Male. Green. Borders and keels of the head and of the thorax for the most part testaceous. Thorax with a few blackish-brown dots. Wings hyaline. Fore wings brown along the exterior border; veins black, tawny towards the base; stigma brown. Length of the body 5 lines; of the wings 14 lines.

Gen. ISPORISA, n. g.

Leusabæ affinis. *Caput* breve, valdè arcuatum, vertice posticè excavato et marginato, fronte facieque marginatis et medio carinatis, fronte subquadrata anticè latiore, facie trigonâ. *Thorax* brevis. *Prothorax* et *mesothorax* tricarinati, carinis lateralibus valdè obliquis. *Alæ* anticæ angustæ, areolis basalibus longissimis, discalibus et marginalibus brevioribus, venis marginalibus simplicibus, venulis transversis costalibus nonnullis exterioribus, submarginalibus nullis.

Allied to *Leusaba*. Head short, much arched; vertex with three angles in front; hind part excavated, and with an elevated border; front and face with elevated borders and with a middle keel; front subquadrate, a little longer than broad, slightly widening in front, its sides indistinctly concave; face triangular, a little broader and longer than the front. Thorax short. Prothorax and mesothorax with three keels, the lateral pair very oblique. Wings narrow. Fore wings with the five basal areolets very long; six discal areolets hardly longer than the marginal areolets, which are rather more numerous; all the latter are simple, and form a continuous row with the few very oblique exterior costal veinlets; no submarginal veinlets.

24. ISPORISA APICALIS, n. s., fœm. Viridis, capite thorace pectoreque nigro maculatis, abdomine nigro, segmentorum marginibus posticis viridibus, pedibus nigro notatis, alis subluridis, anticis apice fuscis, venis nigris basi fulvis, stigmatè nullo.

Female. Green. Head with three black spots in front of the vertex; front and face with reddish borders, each with two black spots. Prothorax and mesothorax with a black dot on each side. Pectus with black spots. Abdomen black; hind borders of the segments green. Legs marked with black. Wings slightly lurid. Fore wings with brown tips; veins black, tawny towards the base; no stigma. Length of the body 3 lines; of the wings 8 lines.

Gen. EPORA, n. g.

Dictyophoræ affinis. *Caput* tricarinatum, suprà transversum; vertex conicus; frons longissima, linearis; facies brevior, lanceolata. *Prothorax* quadricarinatus, valdè arcuatus. *Mesothorax* tricarinatus. *Pedes* longiusculi. *Alæ* anticæ sat angustæ, areolis basalibus longissimis, longitudinis bis trientem occupantibus, discalibus et marginalibus subæqualibus, venulis transversis costalibus obliquis parallelis, submarginalibus nullis.

Allied to *Dictyophora*. Head with three keels, transverse above; vertex conical; front very long, with parallel sides; face lanceolate, much shorter than the front. Prothorax much arched, with four keels. Mesothorax with three keels.

Legs rather long. Fore wings rather narrow; basal areolets as long as two-thirds of the length of the wing; marginal areolets a little longer than the discal areolets, all of them simple; transverse costal veinlets oblique, parallel except towards the tip.

25. *EPORA SUBTILIS*, n. s., mas et fœm. Viridis (mas) aut testacea (fœm.), alis hyalinis, venis viridibus, stigmatè nullo.

Male and Female. Green (*male*) or testaceous (*female*). Wings hyaline; veins green; no stigma. Length of the body $2\frac{1}{2}$ –3 lines; of the wings 6–7 lines.

Gen. DARADAX, *Walk.*

26. *DARADAX ACRIS*, n. s., mas. Viridis, mesothorace tricarinato, abdomine albo-tomentoso, alis anticis fuscescente marginatis, posticis albis.

Male. Green. Head much longer than broad; vertex and front lanceolate, with a keel in the middle and one on each side. Mesothorax with 3 keels. Abdomen with whitish tomentum. Fore wings with brownish borders. Hind wings white. Length of the body 3 lines; of the wings 7 lines.

Subtrib. CIXIODES.

Gen. CIXIUS, *Latr.*

27. *Cixius pustulatus*, *Walk.* See page 87.

28. *CIXIUS FERREUS*, n. s., mas. *C. efferratus* valdè affinis. Ferrugineus, fronte facieque subearinatis, pedibus fulvis, alis subcinereis, anticis maculâ discali interiore guttâque costali exteriore fuscis, venis fulvis.

Male. Very nearly allied to *C. efferratus*. Ferruginous. Head convex between the eyes; front and face with a slight middle keel; front much broader than long; face lanceolate, much longer than the front. Abdomen with the apical appendages much developed. Legs tawny. Wings slightly greyish. Fore wings slightly greyish, with a brown spot in the disk before the middle, and with a brown dot on the costa near the tip; veins tawny. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

29. *CIXIUS DIFFINIS*, n. s. Fuscus, subtùs testaceus, fronte perangustâ, thorace vittâ dorsali fusiformi interlineatâ stramineâ, pedibus testaceis, alis fuscis, anticis fasciis duabus interruptis guttisque nonnullis pallidè viridibus.

Brown, testaceous beneath. Head narrow; vertex slightly concave; front very long and narrow, with three keels. Thorax with a fusiform straw-coloured dorsal stripe, divided longitudinally by a brown line. Legs testaceous. Wings brown. Fore wings with two pale green bands, and with a few pale green dots, of which the largest is on the costa near the tip; 1st band quite interrupted; 2nd slightly interrupted. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

30. *CIXIUS GUTTIFER*, n. s., fœm. Testaceus, capite suprâ subquadrato subtùs lanceolato, pectore guttis duabus anticis lateralibus nigris, alis anticis

pallidè testaceis subhyalinis nigro triguttatis, venis testaceis, posticis cinereis, venis nigricantibus.

Female. Testaceous. Head with elevated borders; vertex subquadrate; front and face with a middle keel; front full thrice longer than broad, slightly increasing in breadth towards the face, which is lanceolate and shorter than the front. Pectus with a black dot on each side in front. Fore wings pale testaceous, nearly hyaline, with a slightly darker spot near the tip of the costa, and with three black dots which form a curved line in the disk; veins testaceous. Hind wings grey with black veins. Length of the body 3 lines; of the wings 7 lines.

31. *CIXIUS ÆQUUS*, n. s., mas. Testaceus rufo varius, albido tomentosus, capite toto valdè angusto lateribus valdè elevatis, alis cinereis, anticarum venulis transversis costalibus duabus, exterioribus paucis.

Male. Testaceous, with some red marks, slightly covered with whitish tomentum. Vertex, front and face very narrow; their borders much elevated. Wings greyish, with two oblique costal veinlets, and with a few discal exterior veinlets. Length of the body 2-2½ lines; of the wings 6-7 lines.

32. *CIXIUS PERPLEXUS*, n. s., mas. Niger, capitis lateribus elevatis carinâ-que testaceis, fronte testaceo conspersâ, vertice perangusto, abdominis segmentis testaceo marginatis, pedibus testaceis, alis anticis cervinis fusco conspersis, costâ margineque interiore pallidioribus guttis nigro-fuscis magis determinatis, posticis nigricantibus.

Male. Black. Head with testaceous elevated borders; vertex very narrow; front and face forming an elongated fusiform compartment with a testaceous keel and testaceous marks. Hind borders of the abdominal segments and legs testaceous. Fore wings fawn colour, sprinkled with brown, paler towards the tips; costa and interior border pale testaceous, with blackish-brown dots. Hind wings blackish. Length of the body 2 lines; of the wings 5 lines.

33. *CIXIUS INCLINATUS*, n. s., mas. Niger, capitis lateribus elevatis carinâ-que testaceis, vertice perangusto, frontis lateribus nigro punctatis, abdominis segmentis testaceo marginatis, pedibus testaceis, alis anticis testaceis fusco conspersis et nebulosis, stigmatibus obscuriore, posticis cinereis.

Male. Black: like the preceding species in structure. Borders of the head and middle keel testaceous; borders of the front with minute black dots. Borders of the abdominal segments and legs testaceous. Fore wings testaceous, sprinkled and clouded with brown; stigma darker. Hind wings grey. Length of the body 1½ line; of the wings 3½ lines.

34. *CIXIUS SIMPLEX*, n. s., mas. Niger, carinis pedibusque piceis, thorace tricarinato, abdomine subtus testaceo, apice albo densè floccoso, alis cinereo-hyalinis, venis nigris, stigmatibus fusco.

Male. Black. Ridges of the head and of the thorax, and legs piceous. Head with the borders much elevated; vertex subquadrate, a little narrower in front; front and face together fusiform, with a rather deep keel. Prothorax extremely short. Mesothorax with three parallel keels. Abdomen

testaceous beneath; tip thickly covered with white flecks. Wings hyaline, slightly cinereous; veins black; exterior transverse veinlets and tips of the apical veins of the fore wings clouded with brown; stigma brown. Length of the body 3 lines; of the wings 7 lines.

35. *CIXIUS VILIS*, n. s., fœm. Niger, frontis lateribus femoribusque fulvis, thorace tricarinato, segmentorum abdominalium marginibus albidis, tibiis tarsisque testaceis, alis hyalinis apice fuscis, venis nigris basi fulvis, stigmatè sordidè testaceo posticè nigro.

Female. Black. Head with elevated borders; vertex very narrow; front with tawny sides, forming with the face a fusiform compartment which has a middle ridge. Prothorax extremely short. Mesothorax with three parallel keels. Segments of the abdomen with whitish borders. Legs testaceous; femora tawny. Wings hyaline, slightly greyish, with brown tips; veins black, tawny at the base; stigma dingy testaceous, black hindward. Length of the body 2 lines; of the wings 5 lines.

36. *CIXIUS MODICUS*, n. s., mas. Testaceus, capite suprâ angusto subtùs fusiformi, thoracis disco abdomineque suprâ fuscis, thorace tricarinato, alis subhyalinis; anticis fusco vix trifasciatis apice fusciscentibus, venis nigris basi testaceis.

Male. Testaceous. Head with elevated borders; vertex narrow; front and face together fusiform with a middle ridge. Mesothorax with three parallel keels; its disk brown. Abdomen above brown; hind borders of the segments testaceous. Wings nearly hyaline; fore wings with three slender and very incomplete brown bands; tips brownish; veins black, testaceous at the base. Length of the body 2 lines; of the wings 5 lines.

37. *CIXIUS NEXUS*, n. s., fœm. Testaceus, capite subtùs perangusto, abdomine nigro marginibus testaceis, alis hyalinis, anticis testaceo fasciatis, fasciis interioribus nigricante marginatis exterioribus fusco nebulosis.

Female. Closely allied to *C. Meander*, Walk. Testaceous. Head with elevated borders, slightly ascending and conical above; front and face very narrow. Abdomen black; hind borders of the segments testaceous. Wings hyaline. Fore wings with irregular testaceous bands, of which the interior have incomplete blackish borders, and the exterior are partly clouded with brown; veins testaceous. Length of the body 2 lines; of the wings $4\frac{1}{2}$ lines.

38. *CIXIUS DESPECTUS*, n. s., fœm. Nigricans, carinis abdomine subtùs pedibusque testaceis, alis cinereo-hyalinis, anticis latis, fasciis plurimis transversis intùs nigricantibus extùs fuscis, venis nonnullis marginalibus furcatis.

Female. Blackish. Ridges of the head, abdomen beneath and legs testaceous. Head slightly conical and ascending above; front and face together almost lanceolate, with a rather high middle keel. Wings hyaline, slightly cinereous; fore wings broad, with several slender and interrupted bands, which are blackish towards the base and brown towards the exterior border; veins testaceous. Length of the body 2 lines; of the wings 5 lines.

This and some of the following species differ slightly from the typical *Cixii* in the veins of the wings, but hardly sufficiently to form new genera.

39. *CIXIUS DEDUCTUS*, n. s., fœm. Piceus, capitis marginibus pedibusque testaceis, vertice subquadrato, fronte breviusculâ, facie lanceolatâ, alis subcinereis, anticarum venis marginalibus apice venulisque transversis infuscatis, margine exteriore albo punctato.

Female. Piceous. Head with elevated testaceous borders; vertex short; front and face with a testaceous keel, the former short, the latter lanceolate. Legs testaceous. Wings greyish; veins of the fore wings black, punctured with testaceous; transverse veinlets and tips of the marginal veins clouded with brown; a row of whitish dots along the exterior border. Length of the body $1\frac{1}{2}$ line; of the wings 4 lines.

40. *CIXIUS MUNITUS*, n. s., fœm. Ferruginosus, capite perangusto lateribus elevatis nigro guttatis, alis fuscis, anticis chalybeo-cinereo quinque-fasciatis.—*Var.* Fronte facieque nigris.

Female. Ferruginous. Vertex, front and face very narrow, with elevated black dotted borders. Wings brown; fore wings with five incomplete grey bands, which are shining and have a chalybeous tinge; veins black, ferruginous towards the base.—*Var.* Front and face black, with ferruginous borders. Length of the body 2 lines; of the wings $5\frac{1}{2}$ lines.

41. *CIXIUS TRAHENS*, n. s., mas. Niger, subtus ferrugineus, capite perangusto lateribus elevatis, pedibus ferrugineis, alis nigricantibus, venis nigris.

Male. Black, ferruginous beneath. Vertex, front and face very narrow, with elevated borders. Legs ferruginous. Wings blackish; veins black. Length of the body $1\frac{1}{2}$ line; of the wings 4 lines.

42. *CIXIUS PALLENS*, n. s., mas. Testaceus, capite sat lato, vertice brevi, fronte longi-subquadratâ, facie lanceolatâ, alis hyalinis, anticis subtestaceis, venis pallidis, areolis basalibus longissimis, discalibus nullis, marginalibus sat longis.

Male. Testaceous. Head moderately broad, with elevated borders; vertex very short; front and face with a middle keel, the former elongate-quadrate, the latter lanceolate. Wings hyaline, with pale veins; fore wings with a slight testaceous tinge, and with only one row of transverse veinlets; basal areolets very long; marginal areolets moderately long, some of their veins forked. Length of the body $1\frac{1}{4}$ line; of the wings 4 lines.

43. *CIXIUS FINITUS*, n. s., fœm. Testaceus, capite thorace pedibusque testaceis, vertice transverso, fronte longi-subquadratâ, facie lanceolatâ, alis nigro-fuscis albo guttatis, anticis latis, venulis transversis vix ullis, venis marginalibus versus costam flexis.

Female. Testaceous. Head with an elevated border; vertex transverse; front and face with a very slight keel; front elongate-subquadrate; face lanceolate. Wings blackish-brown, with several whitish hyaline spots in the disk and along the exterior border; fore wings broad; veins black, ferruginous at the base, mostly simple; subcostal marginal veins curved; only one transverse veinlet. Length of the body 2 lines; of the wings 6 lines.

44. *CIXIUS DILECTUS*, n. s., mas et fœm. Testaceus, *C. finiti* structurâ, alis hyalinis, anticis latis fusco subfasciatis, venis nigris basi testaceis.

Like *C. finitus* and *C. nexus* in structure. *Male* and *Female*. Testaceous. Wings quite hyaline; veins black, testaceous at the base; fore wings broad, with some irregular and incomplete pale brown bands. Length of the body $1\frac{1}{4}$ line; of the wings 4 lines.

45. *CIXIUS DOTATUS*, n. s., mas et fœm. Nigricans, facie pectore pedibusque albidis, alis fuscis, anticis basi fasciâ latâ inferiore maculis quinque exterioribus apiceque hyalinis, stigmate fusco, posticis basi latè hyalinis.

Male and *Female*. Blackish. Face, pectus and legs whitish. Vertex short; front and face with a middle keel; front elongate-subquadrate, with whitish elevated borders; face lanceolate. Wings brown; fore wings with the base, a broad band, five exterior dots and the tips hyaline; veins black, several of them forked; one row of transverse veinlets; stigma black; hind wings hyaline for nearly one-third of the length from the base. Length of the body 1 line; of the wings $3\frac{1}{2}$ lines.

46. *CIXIUS INSUETUS*, n. s., mas. Testaceus, fronte facieque longis perangustis, alis hyalinis albo tomentosis, venis albis.

Male. Testaceous. Head with an elevated border, transverse above; front and face long and very narrow, with a slight middle keel. Wings hyaline, but thickly covered with white tomentum; veins white, much like those of *C. dilectus* in structure. Length of the body $\frac{3}{4}$ line; of the wings 3 lines.

Gen. *BIDIS*, Walk.

47. *BIDIS PICTULA*, n. s., mas et fœm. Viridis rufo nigroque vittata, verticis apice, pectoris maculis duabus abdomineque nigris, alis hyalinis, anticis strigâ apicali guttisque marginalibus fuscis, venis nigris albo fasciatis.

Male and *Female*. Green, with red and black stripes. Head with much elevated borders; vertex narrow in front, black at the tip; front and face narrow and very long, with red disks. Antennæ long, filiform; 2nd joint much longer than the 1st; seta much longer than the 2nd joint. Pectus with two black spots. Abdomen black. Wings hyaline, with brown marks along the borders, and with a brown streak which extends from two-thirds of the length to the tip; veins black, with white bands. Length of the body 3 lines; of the wings 7 lines.

48. *BIDIS PUNCTIFRONS*, n. s., mas et fœm. Testacea rufo vittata, fronte nigro punctatâ, thoracis carinis pallidioribus, alis subhyalinis, anticis guttis marginalibus strigâque apicali dilatatâ fuscis, venis nigris testaceo fasciatis.

Male and *Female*. Testaceous, with red stripes, in structure like *B. pictula*. Front with three rows of black transverse dots; face with black dots at the base. Thorax with three brown stripes. Wings nearly hyaline; fore wings with marginal brown dots, and with an irregular brown streak, which is dilated towards the tip of the wing; veins black, with testaceous bands. Length of the body $3-3\frac{1}{4}$ lines; of the wings $7-7\frac{1}{2}$ lines.

49. *BIDIS CONTIGUA*, n. s., mas. Testacea, rufo vittata, fronte nigro punctatâ, alis subhyalinis, anticis vittâ posticâ nigrâ, venis testaceis.

Male. Testaceous : in structure like *B. pictula*. Head and thorax with red stripes. Front with three rows of black transverse dots. Prothorax with black dots on each side. Mesothorax with three pale brown stripes. Wings nearly hyaline ; fore wings with a black stripe along the interior border ; veins testaceous. Length of the body 3 lines ; of the wings 7 lines.

Gen. *OSTAMA*, n. g.

Caput breve ; vertex subquadratus lateribus subelevatis ; frons plana, longisubquadrata, anticè latior ; facies lanceolata. *Antennæ* longiusculæ, filiformes ; articulus 2^{us} 1^o non longior ; seta brevis. *Mesothorax* tricarinatus. *Alarum* anticarum areolæ basales marginalibus multò longiores ; venæ marginales plurimæ, nonnullæ furcatæ.

Head short ; vertex subquadrate, with elevated borders ; front smooth, elongate-subquadrate ; face lanceolate, a little shorter than the front. *Antennæ* filiform, rather long ; 2nd joint as long as the 1st ; seta short. *Mesothorax* with three slight parallel keels. Fore wings with a row of transverse veinlets which divides the basal veins from the marginal veins, the former nearly twice the length of the latter, which are rather numerous, and some of them forked.

50. *OSTAMA JUNCTA*, n. s., mas. Ferruginea subtùs nigra, abdominis dorso tibiisque rufis, alis anticis fuscis testaceo conspersis, apices versus hyalinis vittâ arcuatâ strigâque nigro-fuscis, posticis cinereis.

Male. Ferruginous, black beneath. Borders of the thorax testaceous. Abdomen above and tibiæ red. Fore wings brown, with numerous testaceous punctures ; part beyond the transverse veinlets hyaline, with a curved stripe and a streak of a blackish-brown hue ; hind wings grey. Length of the body 2½ lines ; of the wings 7 lines.

Gen. *ERANA*, n. g.

Caput lateribus elevatis carinâque mediâ ; vertex subconicus ; frons subquadrata, faciem versus latior ; facies lanceolata. *Antennæ* longæ, validæ, filiformes ; articulus 1^{us} brevis ; 2^{us} longus ; seta nulla. *Mesothorax* carinis tribus parallelis. *Alarum* anticarum areolæ basales discalibus et marginalibus triplò longiores ; venulæ transversæ costales paucæ perobliquæ.

Head with elevated borders and with a middle keel ; vertex nearly conical ; front elongate-subquadrate, broader towards the face which is lanceolate. *Antennæ* elongated, stout, filiform ; 1st joint short ; 2nd long ; no arista. *Mesothorax* with three parallel keels. Fore wings with the basal areolets full thrice longer than the discal and marginal areolets together ; the marginal areolets as long as the discal areolets and not more numerous ; costal transverse veinlets few and very oblique.

51. *ERANA OPEROSA*, fœm. Ferruginea ; alis anticis apud venas chalybeo notatis, posticis nigricantibus.

Female. Ferruginous. Fore wings with chalybeous spangles on the veins ; hind wings blackish. Length of the body 2½ lines ; of the wings 6 lines.

Gen. RHOTALA, n. g.

Caput suprâ conicum, lateribus elevatis, fronte facieque planis, elongatis, punctulatis. *Antennæ* breviusculæ, filiformes; articulus 2^{us} 1^o longior; arista longa, gracilis. *Prothorax* sat magnus; arcâ mediâ conicâ, tricarinatâ. *Alæ* anticæ areolis basalibus longissimis, venulis transversis plurimis exterioribus nonnullisque costalibus.

Vertex conical, with elevated borders; front and face forming a fusiform compartment which is flat and punctured. *Antennæ* cylindrical, rather short; arista long, slender. *Prothorax* well developed; middle part conical, with three keels. Fore wings with very long basal arcolets, and with several transverse veinlets on the marginal arcolets; exterior part of the costa with some oblique parallel veinlets.

52. RHOTALA DELINEATA, n. s., mas et fœm. Testacea, vertice thorace alisque anticis crebrè ferrugineo conspersis, fronte facie pectoreque nigris, pedibus ferrugineis nigro variis, anticis testaceo fasciatis, alis posticis nigricantibus.

Male and *Female*. Testaceous. Vertex, thorax and fore wings thickly covered with ferruginous dots. Fore wings with three short black streaks forming an oblique transverse line. Head beneath and pectus black. Legs ferruginous, with black marks; fore legs with testaceous bands. Hind wings blackish. Length of the body 4 lines; of the wings 10 lines.

Trib. ISSITES, *Spinola*.Gen. ISSUS, *Fabr.*

53. ISSUS PRÆCEDENS, n. s., fœm. Piceus, capitis lateribus elevatis, vertice longi-subquadrato, fronte anticè dilatatâ testaceâ, pectore pedibusque testaceo notatis, alis anticis nitentibus testaceo subobsoletè guttatis, posticis nigricantibus.

Nearly allied to *I. sinensis*. *Female*. Piceous. Head with elevated borders; vertex elongate-subquadrate; front broader and testaceous in front. Pectus and legs with testaceous marks. Fore wings shining, with indistinct testaceous dots. Hind wings blackish. Length of the body 3 lines; of the wings 6 lines.

54. ISSUS COMPOSITUS, n. s., mas. Obscurè testaceus, capite thorace alisque anticis nigro confertissimè conspersis, capitis lateribus elevatis, vertice transverso, fronte tricarinatâ, alis anticis latis plagâ nigrâ submarginali, angulo interiore acuto, posticis cinereis.—*Var.* Alis anticis pallidioribus plagâ nullâ.

Male. Dull testaceous. Head, thorax and fore wings thickly sprinkled with black. Head with elevated borders; vertex transverse; front with three keels, slightly broader in front. Legs with a few black marks. Fore wings broad, with a black patch near the interior border; interior angle prominent, almost acute; hind wings grey.—*Var.* Fore wings paler, with no black patch. Length of the body 4 lines; of the wings 8 lines.

55. ISSUS RETRACTUS, n. s., mas. Piceus latus, capitis lateribus elevatis fulvis, vertice transverso, fronte latâ, carinâ mediâ subobsoletâ carinâque

transversâ posticâ, facie, mesothoracis disco pedibusque fulvis, alis anticis non angulatis, posticis nigro-cinereis.

Male. Piceous, broad. Head with elevated tawny borders; vertex much broader than long; front hardly longer than broad, very slightly broader in front, with a slight middle keel and a more distinct transverse keel towards the vertex; face, disk of the mesothorax and legs tawny. Fore wings not angular, conical towards the tips; hind wings blackish grey, with many transverse veinlets. Length of the body 3 lines; of the wings 6 lines.

56. *ISSUS FURTIVUS*, n. s., fœm. Cervinus, capitis lateribus elevatis, vertice subquadrato, fronte anticè latiore lateribus tuberculatis concavis carinâ mediâ subobsoletâ, alis anticis fusco variis non angulatis, posticis nigro-cinereis.

Female. Fawn-colour. Head with elevated borders; vertex a little longer than broad, indented behind with a corresponding angle in front; front elongate-subquadrate, broader towards the face, with concave minutely tuberculated sides and with a nearly obsolete middle keel. Fore wings with various brown marks, not angular; hind wings blackish-grey. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

57. *ISSUS PATULUS*, mas. Piceo-ferrugineus; capite testaceo, marginibus elevatis, vertice parvo quadrato, fronte longâ carinatâ anticè latiore, pedibus fulvis, alis posticis nigro-cinereis.

Male. Pitchy ferruginous. Head testaceous, with elevated borders; vertex small, quadrate; front more than twice longer than broad, a little broader towards the face, with a distinct middle keel. Legs tawny. Hind wings blackish-brown. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

58. *ISSUS INERS*, mas. Piceo-ferrugineus, capite fulvo lateribus testaceis, marginibus elevatis, fronte longâ carinatâ anticè dilatâ, pedibus fulvis, alis posticis nigro-cinereis.

Male. Pitchy ferruginous. Head tawny, with elevated borders; sides testaceous; vertex small, quadrate, dilated towards the face, with a distinct middle keel. Legs tawny. Hind wings blackish-grey. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

59. *ISSUS GRAVIS*, n. s., mas. Ferrugineus, capitis marginibus elevatis, vertice conico, fronte carinatâ obconicâ, facie transversâ disco nigricante, alis anticis venulis transversis nullis, posticis subhyalinis, venis venulisque paucis.

Male. Ferruginous. Head with elevated borders; vertex conical, with a brown mark on each side; front obconical, with a distinct middle ridge and a slight oblique ridge on each side; face transverse, blackish, with a testaceous border. Legs tawny, with some ferruginous marks. Fore wings with no transverse veinlets; hind wings subhyaline, with very few veins and veinlets. Length of the body 3 lines; of the wings 6 lines.

60. *ISSUS ARCTATUS*, n. s., fœm. Ferrugineus, capitis marginibus elevatis, vertice transverso, fronte carinatâ subquadratâ anticè latiore, facie carinatâ brevi-lanceolatâ, pedibus testaceis, alis posticis cinereis.

Female. Ferruginous. Head with elevated borders; vertex much broader

than long; front a little longer than broad, slightly wider in front, with a slight keel; face keeled, short-lanceolate. Legs testaceous. Hind wings grey. Length of the body 3 lines; of the wings 7 lines.

61. *ISSUS SOBRINUS*, n. s., mas. Fulvus, capitis lateribus albidis, marginibus elevatis, vertice transverso minimo, fronte longâ carinatâ anticè latiore, facie lanceolatâ carinatâ, alis posticis nigro-cinereis.

Male. Tawny. Head with whitish sides and elevated borders; vertex transverse, very small; front twice longer than broad, slightly widening in front, with a distinct keel; face keeled, lanceolate. Hind wings blackish-grey. Length of the body 2 lines; of the wings 5 lines.

62. *ISSUS OVALIS*, n. s., mas. Sordidè testaceus, capite latissimo lateribus elevatis, vertice transverso punctis duobus nigris, fronte transversâ carinatâ, alis anticis plagâ costali sordidè albidâ, posticis nigro-cinereis.

Male. Dingy testaceous. Head very broad; vertex, front and face transverse, with elevated borders; vertex twice broader than long, with a minute black dot on each side in front; front and face with a slight keel, the former a little broader than long, the latter lanceolate. Fore wings with a dingy whitish patch by the middle of the costa; hind wings blackish-grey. Length of the body 2 lines; of the wings 5 lines.

63. *ISSUS LITEROSUS*, n. s., mas. Testaceus, capitis marginibus elevatis, vertice transverso, fronte quadratâ carinatâ, carinâ transversâ guttisque duabus posticis, facie lanceolatâ, alis anticis nigro plagiatis, posticis fusco-cinereis.

Male. Testaceous. Head with elevated borders; vertex much broader than long; front subquadrate, with a slight middle keel, and a more distinct transverse keel near the vertex, where there is a black dot on each side; face lanceolate. Fore wings with a few black patches; hind wings brownish-grey. Length of the body 3 lines; of the wings 6 lines.

64. *ISSUS LINEATUS*, n. s., mas. Testaceus nigro varius, capitis marginibus elevatis, vertice conico depresso, fronte longâ subearinatâ anticè latiore, facie lanceolatâ, abdominis dorso rufo, segmentis testaceo marginatis, alis testaceo reticulatis, anticis nigro-fuscis, posticis rufescentibus.

Male. Testaceous, with black marks. Head with elevated borders; vertex conical, depressed, with a black spot on each side; front twice longer than broad, with a slight middle keel, much wider towards the face which is lanceolate. Abdomen red above; hind borders of the segments testaceous. Wings with testaceous veins and veinlets, the latter numerous; fore wings blackish-brown; hind wings reddish. Length of the body 4 lines; of the wings 8 lines.

Gen. *HIRACIA*, n. g.

Corpus ellipticum, convexum. *Caput* marginibus vix elevatis; vertex conicus, tricarinatus; frons faciesque carinis tribus vix conspicuis, hæc lanceolata, illa obconica anticè excavata. *Prothorax* transversus, quinque-carinatus, anticè angustior. *Mesothorax* trigonus, tricarinatus, apice acutus. *Alæ* anticæ venis venulisque transversis plurimis elevatis, apice acuminatæ.

Body elliptical, convex. Head with the borders hardly elevated; vertex conical, with three distinct keels; front and face with three indistinct keels, the former obconical, excavated next the face, which is lanceolate. Prothorax full twice broader than long, narrower in front, with five keels. Mesothorax triangular, acuminate, with three keels. Fore wings acuminate, with numerous rugulose veins and transverse veinlets.

65. *HIRACIA IGNAVA*, n. s., fœm. Cervina, verticis apice nigro, pedibus et alis anticis nigro guttatis, alis posticis nigris. *Female*. Fawn-colour. Vertex black at the tip. Legs and fore wings with a few black dots. Hind wings blackish. Length of the body 5 lines; of the wings 10 lines.

Gen. HEMISPHERIUS, *Schaum*.

66. *HEMISPHERIUS NIGER*, n. s., mas et fœm. Niger nitens subtus fulvescens aut testaceus, alis anticis confertissimè cribratis, posticis nigro-cinereis.

Male and Female. Black, shining, tawny or testaceous beneath. Fore wings thickly covered with minute punctures; hind wings blackish-grey. Length of the body 1-1½ line; of the wings 3-3½ lines.

67. *HEMISPHERIUS TYPICUS*, n. s., mas. Testaceus, alis anticis fusco bifasciatis, fasciâ 2â arcuatâ, posticis subcinereis.

Male. Testaceous. Fore wings with two brown bands, the hind one undulating; hind wings greyish. Length of the body 1 line; of the wings 3 lines.

68. *HEMISPHERIUS TORPIDUS*, n. s., mas. Testaceus nitens, alis anticis confertissimè cribratis, posticis subcinereis.

Male. Testaceous, shining. Fore wings thickly covered with very minute punctures; hind wings greyish. Length of the body ¾-1 line; of the wings 2½-3 lines.

Gen. EURYBRACHYS, *Guérin*.

69. *Eurybrachys insignis*, *Westw. Ann. Nat. Hist.* 1842, 119; *Hope, Trans. Linn. Soc.* xix. 134. 27. pl. 12. f. 9.

Inhabits also Manilla. *E. multicolor*, p. 88, may be a variety of this species.

70. *EURYBRACHYS CONSERVA*, n. s., fœm. Testacea, capite truncato-conico, fronte obconicâ subcarinatâ sulco antico transverso, facie basi sulcatâ, prothorace vittis duabus obliquis nigris, alis anticis reticulatis nigro variis costâ dilatatâ, posticis albis.

Closely allied to *E. tuberculosa*? *Female*. Testaceous. Head above truncate-conical; front obconical, with a short keel behind and with a transverse furrow in front; face lanceolate, with a short furrow behind. Prothorax with two black oblique stripes. Fore wings with various black marks, reticulated with numerous transverse veinlets, slightly tuberculated; costa dilated, with very numerous transverse veinlets; hind wings white. Length of the body 7 lines; of the wings 16 lines.

71. *EURYBRACHYS VETUSTA*, n. s., fœm. Viridescens subtùs testacea, capite truncato-conico, fronte obconicâ carinatâ, facie carinatâ, mesothorace fusco notato, alis anticis reticulatis, posticis subcinereis.

Female. Pale dull green, testaceous beneath. Head above truncate-conical; front elongate-obconical, with a keel, which does not extend to the fore border; face lanceolate, with a keel in front. Mesothorax with some brown marks on each side. Fore wings reticulated with numerous transverse veinlets, slightly tuberculated; costa slightly dilated, with very numerous transverse veinlets; hind wings pale greyish. Length of the body 5 lines; of the wings 14 lines.

72. *EURYBRACHYS INTERCEPTA*, n. s., mas. Pallidè viridis subtùs testacea, capite brevi-conico subtùs lanceolato plano lateribus elevatis, alis anticis strigâ basali guttisque duabus apud marginis interioris apicem nigris, posticis albidis.

Male. Pale green, testaceous beneath. Head above short-conical; front and face together lanceolate and with elevated borders, but not keeled. Fore wings with a black basal streak and with two black dots near the end of the interior border. Hind wings whitish. Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines.

73. *EURYBRACHYS SURRECTA*, n. s., mas. Pallidè cervina subtùs pallidè testacea, capite lateribus elevatis, vertice conico carinato, fronte facieque planis, illâ lineari, alis anticis maculâ basali guttisque duabus discalibus exterioribus nigris, costâ undulatâ, posticis albis.

Male. Pale fawn-colour, pale testaceous beneath. Head with elevated borders; vertex conical, with a middle keel; front and face not keeled, the former linear. Fore wings with a black basal spot, and with two black discal dots; costa undulating; hind wings white. Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines.

Subtrib. FLATOÏDES, *Spinola*.

Gen. FLATOÏDES, *Guérin*.

74. *Flatoïdes guttatus*, *Walk. Cat. Homopt.* pt. 2. 408. 9.

Inhabits also China.

75. *Flatoïdes marginalis*, *Walk.* See page 89.

76. *Flatoïdes discalis*, *Walk.* See page 89.

77. *FLATOÏDES VETERATOR*, n. s., mas. Niger, capite thoracisque lateribus testaceis, alis anticis apud margines nitentibus, fasciâ interiore plagâque exteriore cinereis, guttâ discali atrâ, posticis nigro-cupreis.

Male. Black. Head and sides of the thorax testaceous. Fore wings shining about the borders, with an inner cinereous band, and an outer cinereous patch, the latter including a deep black dot. Hind wings blackish cupreous. Length of the body 4 lines; of the wings 10 lines.

78. *FLATOÏDES POSTERUS*, n. s., mas. Piceus, pedibus fulvis, alis nigricantibus, anticis apud marginem interiorem nigro-fuscis, fasciâ brevi anticâ strigisque duabus marginalibus hyalinis.

Male. Piccous. Legs fawny. Wings blackish; fore wings blackish-brown

about the interior border, with a hyaline band extending from the middle of the costa to the disk, and with two marginal hyaline streaks. Length of the body 3 lines; of the wings 8 lines.

79. *FLATOÏDES LIMITARIS*, n. s., mas. Piceus subtus testaceus, alis anticis apud margines nitentibus, plagâ cinereâ maculâque nigrâ discalibus, maculâ costali albâ.

Male. Piceous; under side and legs testaceous. Thorax with three keels. Fore wings shining about the borders; middle of the disk cinereous, and including a black spot; a white spot on the middle of the costa. Length of the body 3-4 lines; of the wings 8-10 lines.

80. *FLATOÏDES STUPIDUS*, n. s., fœm. Fulvus subtus testaceus, alis nigro-æneis, apud margines nitentibus, anticis guttis duabus (unâ costali, alterâ subcostali) albidis, subapicali nigrâ.

Female. Tawny, testaceous beneath. Wings blackish æneous, shining about the borders; fore wings with a black subapical dot, with two indistinct whitish dots, one costal, the other subcostal. Length of the body 3 lines; of the wings 8 lines.

This species and the preceding and *F. veterator* are very closely allied.

Gen. RICANIA, Germar.

81. *RICANIA OSMYLOIDES*, n. s., mas. Testacea, capite thoraceque nigro maculatis, alis hyalinis, anticis maculis marginalibus fascisque duabus incompletis nigris, stigmatе albido, posticis nigro marginatis.

Male. Testaceous. Vertex arched, with two black stripes; front with five black stripes, the middle one and the exterior pair shortened in front; four spots in front and the borders also black; face with a black stripe. Prothorax with two black stripes; mesothorax with eight black spots. Wings hyaline, with two incomplete black bands; veins black; fore wings with black marginal spots, and with a whitish stigma; hind wings with black borders. Length of the body 4 lines; of the wings 12 lines.

82. *RICANIA SUBACTA*, n. s., fœm. Testacea, fronte carinatâ, abdominis apice nigro nitido, alis hyalinis nigro-venosis, anticis stigmatе nigro.

Female. Testaceous. Head with elevated borders; vertex arched; front with a middle keel. Abdomen black and shining at the tip. Wings hyaline; veins black; fore wings with a black stigma. Length of the body 3 lines; of the wings 8 lines.

Gen. BENNA, Walk.

83. *BENNA CANESCENS*, n. s., mas et fœm. Testacea, capitis marginibus elevatis, fronte facieque perangustis, halteribus apice albis, alis subcinereis, anticis guttâ basali nigrâ, stigmatе albido.

Male and Female. Testaceous. Head with elevated borders; front and face very narrow. Halteres with white tips. Wings very pale cinereous; veins blackish, testaceous at the base; fore wings with a black basal dot and with a whitish stigma, their transverse veinlets fewer than those of *B. capitulata*. Length of the body 3 lines; of the wings 8 lines.

84. *BENNA CLARESCENS*, n. s., mas. Testacea, halteribus apice albis, alis subcinereis, anticis extùs albido lituratis, fasciâ interiore fuscâ.

Male. Testaceous; like the preceding species in structure. Halteres with white tips. Wings greyish; fore wings with a brown band before the middle, and with exterior whitish marks; veins testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

85. *BENNA PRÆSTANS*, n. s., fœm. Ferruginea subtùs fulva, alis subhyalinis, anticis triente basali ferrugineâ fusco marginatâ.

Female. Ferruginous, tawny beneath; like the two preceding species in structure. Wings nearly hyaline; third part from the base of the fore wings ferruginous with a brown border; veins testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Gen. SERIDA, n. g.

Caput subascendens, lateribus elevatis angulum acutum utrinque fingentibus; vertex linearis; frons angusta, carinata, anticè dilatata; facies lanceolata, subcarinata. *Thorax* tricarinatus. *Alæ* anticæ angulis rotundatis, venulis costalibus venisque marginalibus plurimis.

Head slightly ascending, with elevated borders, forming a slightly acute angle on each side in front of the vertex which is linear; front narrow, with a distinct keel, widening towards the face which is lanceolate, and has a slight keel. Thorax with three slight keels. Fore wings moderately broad, with rounded angles; marginal veins and costal veinlets very numerous, the latter oblique and parallel.

86. *SERIDA LATENS*, n. s., mas. Fulva, frontis lateribus basi prothoraceque nigro guttatis, alis anticis guttis paucis discalibus costâ lineisque transversis exterioribus nigricantibus, apice cinereo-hyalinis lineolis duabus obliquis nigricantibus.

Male. Tawny. Sides of the front at the base and prothorax with black dots. Fore wings with the costa, some discal spots, and some exterior transverse lines blackish; tips cinereous hyaline, with two short oppositely oblique black lines. Length of the body 4 lines; of the wings 10 lines.

87. *SERIDA FERVENS*, n. s., mas. Fulva, fronte viridi sat latâ, marginibus carinâque fulvis, alis apice fuscis, anticis fusco bifasciatis.

Male. Tawny. Front green, moderately broad, with the borders and the keel tawny. Wings with brown tips; fore wings with two brown bands, one near the base, the other oblique irregular and beyond the middle. Length of the body 3 lines; of the wings 8 lines.

This species differs much in the structure of the front from *S. latens*, which is the type of the genus.

Gen. PARICANA, n. g.

Caput læve, planum; vertex brevis; frons longi-subquadrata; facies lanceolata. *Antennæ* aristâ longâ gracili. *Thorax* tricarinatus. *Alæ* anticæ apice latæ rotundatæ, areolis mediis et marginalibus longitudine subæqualibus.

Head smooth, not keeled nor with elevated borders; vertex short; front

elongate-subquadrate; face lanceolate. Antennæ with a long and slender arista. Thorax with three keels. Fore wings broad and rounded towards the tips; basal areolets about half the length of the wing; middle and apical areolets of nearly equal length; a few oblique costal transverse veinlets beyond the middle.

88. *PARICANA DILATIPENNIS*, n. s., fœm. Testacea, fronte facie apice pectorisque fasciâ nigris, alis hyalinis, anticis fasciis duabus (unâ basali, alterâ mediâ) fuscis.

Female. Testaceous. Head shining; front and tip of the face black. Pectus with a black band. Wings hyaline; veins black, tawny at the base; fore wings with a black band near the base and another across the middle. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Gen. NICERTA, n. g.

Corpus gracile. *Caput* compressum, perangustum; vertex lateribus valdè elevatis; frons cultriformis; facies lanceolata. *Antennæ* articulo 2^o longo, cylindrico. *Alæ* angustæ; anticæ venis paucis, venulis nonnullis transversis exterioribus posterioribus.

Body slender. Head much compressed, very narrow; vertex with the borders much elevated; front forming an acute edge; face lanceolate. Antennæ with the 2nd joint long and cylindrical. Wings narrow; fore wings with few veins; hind part beyond the middle with some transverse veinlets.

89. *NICERTA SUBMENTIENS*, n. s., mas. Albida, oculis fulvis, alis albo-hyalinis, venis albis.

Male. Whitish. Eyes tawny. Wings whitish hyaline; veins white. Length of the body 3 lines; of the wings 7 lines.

90. *NICERTA FLAMMULA*, n. s. Lætè et saturatè rosea, tarsis albidis.

Very bright rosy-red. Tarsi whitish. Length of the body $1\frac{1}{2}$ line; of the wings 5 lines.

91. *NICERTA FERVENS*, n. s. Testacea, capite elongato strigis rufis, alis anticis rufis hyalino guttatis, posticis hyalinis.

Testaceous. Head much elongated, conical when viewed laterally, streaked with red. Fore wings red, with very numerous hyaline spots. Hind wings hyaline. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

Gen. EUCARPIA, n. g.

Caput breve, marginibus valdè elevatis; vertex transversus, subquadratus; frons et facies carinatæ, hæc lanceolata, illa subquadrata. *Thorax* brevis, bicarinatus. *Pedes* breves, tenues. *Alæ* angustæ; anticæ areolis discalibus perpaucis, marginalibus plurimis.

Head short, with the borders much elevated; vertex and front subquadrate, the former transverse; front and face keeled, the latter lanceolate. Thorax short; scutum with two parallel keels. Legs short, slender. Wings narrow. Fore wings slightly widening from the base to the tips which are rounded; discal areolets very few; marginal areolets large, numerous.

92. *EUCARPIA UNIVITTA*, n. s. Ferruginea subtus testacea, capitis thoracisque

carinis pedibusque testaceis, alis anticis fuscis, disco margineque tenui flavis, posticis cinereo-hyalinis.

Ferruginous, testaceous beneath. Borders and keels of the head and of the thorax and legs testaceous. Fore wings brown; the middle of the disk and a slender stripe along the border yellow. Hind wings greyish hyaline. Length of the body $1\frac{1}{4}$ line; of the wings 4 lines.

Gen. RHOTANA, n. g.

Capitis vertex cultriformis; frons trigona; facies lanceolata. *Prothorax* brevissimus. *Mesothorax* carinis duabus vix conspicuis, lateribus elevatis. *Alæ* latæ; anticæ venis venulisque transversis paucis.

Vertex of the head forming a sharp edge; front triangular, acuminated towards the vertex; face lanceolate. *Prothorax* very short. *Mesothorax* with elevated borders and with two indistinct keels. Wings broad; fore wings with a few veins, some of which are forked, and with only one line of transverse veinlets.

93. RHOTANA LATIPENNIS, n. s., mas. Testacea, capitis margine rufo, alis hyalinis, anticis cervino nebulosis maculâ posticâ subapicali nigrâ, posticis maculâ magnâ apicali nigrâ.

Male. Testaceous. Head red along the edge. Wings hyaline; veins testaceous; fore wings slightly clouded with fawn-colour, with a black posterior subapical spot; hind wings with a large black apical spot. Length of the body 2 lines; of the wings 5 lines.

Gen. POCHAZIA, *Amyot et Serv.*

94. Pochazia fumata, *Amyot*. See page 91.

95. POCHAZIA CONVERGENS, n. s., mas. Nigra, fronte latissima, abdominis apice albo floccoso, alis anticis vittâ discali arcuatâ hyalinâ, posticis hyalinis ex parte nigro marginatis.

Male. Black. Front very broad. Abdomen with white flecks at the tip. Fore wings with a curved hyaline discal stripe which is attenuated at each end; hind wings hyaline, bordered with black except along the costa and at the tips. Length of the body 4 lines; of the wings 15 lines.

Gen. NEPHESA, *Amyot et Serv.*

96. NEPHESA GRATA, n. s. Pallidè viridis, pedibus testaceis, alis anticis purpureo marginatis angulo exteriore rotundato interiore acutiore, posticis albis.

Pale green. Legs testaceous. Fore wings with narrow purple borders; apical angle rounded; interior one rectangular, well defined; hind wings white. Length of the body 4-5 lines; of the wings 12-14 lines.

97. NEPHESA GUTTULARIS, n. s. Pallidè testacea, alis albis, anticis nigro guttatis angulo exteriore rotundato interiore subobtusio.

Pale testaceous. Wings white; fore wings with about eighteen black dots; apical angle rounded, interior one slightly obtuse. Length of the body 3 lines; of the wings 10 lines.

98. *NEPHESA VOLENS*, n. s. Pallidè testacea, alis anticis subobsoletè luteo marginatis angulo exteriore rotundato interiore subobtusato, posticis albis.

Pale testaceous. Fore wings indistinctly bordered with luteous; apical angle rounded; interior one slightly obtuse. Length of the body 3 lines; of the wings 9 lines.

99. *NEPHESA LUTEA*, n. s. Lutea, alis anticis angulo exteriore valdè rotundato interiore producto acuto, posticis albis.

Luteous. Fore wings with fewer veins than those of the three preceding species; apical angle very much rounded; interior one produced, acute. Hind wings white. Length of the body 3 lines; of the wings 8 lines.

100. *Nephesa marginella*, Guér. *Icon. Règne Anim. Ins.* pl. 58. f. 6. *texte*, 359 (Ricania).

Inhabits also Cochin China.

The acute front of this species distinguishes it from every other in the genus.

101. *NEPHESA DEDUCTA*, n. s. Viridis, alis anticis luteo marginatis, angulis rotundatis, posticis albis.

Green. Fore wings with luteous borders; apical angle much rounded; interior one slightly rounded. Hind wings white. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

102. *NEPHESA TRIPARS*, n. s., mas. Viridis subtùs pallida, alis anticis deflexis luteo marginatis angulo exteriore rotundato interiore vix rotundato, posticis albis.

Male. Green, pale green beneath. Fore wings with luteous borders; apical angle rounded; interior one almost rectangular, hardly rounded. Hind wings white. Length of the body 3 lines; of the wings 11 lines.

The fore wings of this species are deflexed in repose, not vertical as in the other species of the genus.

Gen. FLATA, *Fabr.*

103. *Flata obscura*, *Fabr.* See page 92.

Gen. COLOBESTHES, *Amyot et Serv.*

104. *Colobesthes albiplana*, *Walk.* See page 92.

Gen. PÆCILOPTERA, *Latr.*

105. *Pæcilopectera circulata*, Guér. *Icon. Règne Anim. texte*, 361.

Inhabits also Java.

106. *Pæcilopectera maculata*, Guér. See page 92.

Var. More like the Java specimens than those from Malacca, but differing from both.

107. *PÆCILOPTERA RORIDA*, n. s., mas. Testacea subtùs albida, alis anticis subfuscis albo guttatis, vittâ undulatâ pallidissimè purpurascente, margine interiore albido punctato, posticis albis.

Male. Testaceous, whitish beneath. Abdomen and hind wings white. Fore

wings very pale brown, with many minute white dots, and with a forked, much curved, very pale purplish stripe which includes a spot, and is interrupted along the exterior border; interior border darker, with white points towards the base. Length of the body 5 lines; of the wings 20 lines.

108. *PÆCIOPTERA DEPLANA*, n. s., mas. Pallidè testacea, capite angusto lateribus elevatis, antennis tibiis tarsisque anticis nigris, alis albis, anticis lineis tribus exterioribus nigris fasciisque duabus arcuatis (unâ submarginali, alterâ marginali) fuscis.

Male. Pale testaceous. Head narrow, with the borders much elevated. Antennæ, fore tibiæ and fore tarsi black. Wings white. Fore wings pale testaceous at the base, with three exterior black lines, of which two are by the interior border, and the third is discal, angular, and much longer than the others; two pale brown curved bands, one submarginal, parallel to the other which is marginal. Length of the body 4 lines; of the wings 12 lines.

Gen. *FICARASA*, n. g.

Caput lateribus elevatis; vertex arcuatus; frons subcarinata; lateribus angulatis; facies lanceolata. *Prothorax* valdè arcuatus. *Mesothorax* tricarinatus. *Alæ* antiçæ areolis basalibus longissimis, mediis et marginalibus subæqualibus, venulis plurimis transversis costalibus et exterioribus plurimis.

Head with elevated borders; vertex transverse, arched; front elongate, with a slight middle keel, with a slight groove along each side, and with very obtusely angular borders; face lanceolate. Fore wings rather narrow, rounded towards the tips; basal areolets more than half the length of the wing; marginal areolets very little longer than the middle areolets, several of which are forked; costal veinlets and exterior veinlets numerous, the former oblique and parallel.

109. *FICARASA PALLIDA*, n. s., mas. Pallidè testacea, alis hyalinis, venis testaceo-albidis.

Male. Pale testaceous. Wings hyaline; veins whitish testaceous. Length of the body 3 lines; of the wings 10 lines.

Gen. *EUPILIS*, *Walk.*

110. *Eupilis albilincola*, *Walk.* See page 93, where the length of the wings is erroneously stated to be 7 instead of 12 lines.

111. *EUPILIS HEBES*, n. s., mas et fœm. Testacea, fronte maculis duabus posticis vittâque nigris, vertice thoraceque nigro guttatis, alis subcinereis, venis ferrugineis.

Male and Female. Testaceous. Vertex with two black dots; front with two black spots towards the vertex, and with a black stripe which extends to the face. Thorax with a few black dots. Wings very slightly greyish; veins ferruginous. Length of the body 3-4 lines; of the wings 8-10 lines.

Fam. MEMBRACINA, *Burmeister*.Gen. CENTROTUS, *Fabr.*

112. *Centrotus Taurus*, *Fabr.* See page 93.

113. *CENTROTUS SUBSIMILIS*, n. s., fœm. Niger obscurus, thorace scabro gibboso, cornubus lateralibus rectis acutis, cornu postico abdominis apicem superante, scutello pectorisque maculis duabus albidis, alis subluridis, costâ venisque nigris.

Female. Black. Thorax scabrous, elevated; lateral horns acute, extending at right angles to the body; scutellum, and a spot on each side of the pectus whitish. Wings slightly lurid; costa and veins black. Length of the body 3 lines; of the wings 7 lines.

Very nearly allied to *C. Taurus*, from which it is distinguished by its shorter, straight, and horizontal lateral horns.

114. *Centrotus laminifer*, *Walk.* See page 93.

Exceeding in size the specimen from Malacca.

115. *Centrotus vicarius*, *Walk. Cat. Homopt.* pt. 2. 605.

Inhabits also Java.

116. *CENTROTUS LIMBATUS*, n. s. Niger, thoracis vittis tribus, abdomine subtus pedibusque albidis, cornubus lateralibus parvis, cornu postico abdominis apicem vix attingente.

Black. Thorax with three white stripes which are united in front and behind; the lateral pair curved, including the lateral horns, and dilated at the base of the hind horn; lateral horns acute, as long as half the space between them; hind horn extending nearly to the tip of the abdomen, which is whitish beneath. Legs whitish. Wings greyish hyaline, with black veins. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

117. *CENTROTUS LATIMARGO*, n. s. Ater, thoracis cornubus lateralibus latis planis acuminatis bicarinatis, cornu postico abdominis apicem non attingente, tarsis posticis albidis, alis testaceo-hyalinis, anticis apud costam latè nigris.

Deep black, scabrous. Lateral horns of the thorax broad, flat, acuminate, with two ridges, slightly inclined backward, each as long as the space between them; hind horn extending nearly to the tip of the abdomen. Hind tarsi whitish. Wings testaceous hyaline. Fore wings with a broad black costal stripe. Length of the body 3 lines; of the wings 7 lines.

Nearly allied to *C. Assamensis*, *Fairm.*

118. *CENTROTUS DENSUS*, n. s., mas. Niger obscurus scabrosus, thoracis cornubus lateralibus acuminatis carinatis subascendentibus, cornu postico abdominis apicem superante, scutello maculis duabus albidis, alis posticis cinereo-hyalinis.

Male. Black, dull, scabrous, stout. Lateral horns of the thorax acute, ridged, obliquely ascending, each a little shorter than the space between them; hind horn extending a little beyond the tip of the abdomen; scutellum

with a whitish spot on each side. Hind wings greyish hyaline. Length of the body $2\frac{3}{4}$ lines; of the wings 7 lines.

119. *CENTROTUS VARIPES*, n. s., fœm. Niger obscurus scabrosus, thorace carinato, cornubus lateralibus acuminatis carinatis subrecurvis, cornu postico brevi, tibiis tarsisque posterioribus albidis, his apice nigris, alis subcinereo-hyalinis, anticis costâ nigrâ.

Female. Black, dull, scabrose. Thorax with a slight keel; lateral horns acute, ridged, slightly curved backward and ascending, each as long as the space between them. Hind tibiæ and hind tarsi whitish, the latter black towards the tips. Wings hyaline, slightly cinereous; veins black; costa of the fore wings black for two-thirds of the length from the base. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

120. *Centrotus caliginosus*, *Walk.* See page 93.

121. *CENTROTUS CICADIFORMIS*, n. s., fœm. Niger obscurus scabrosus, thoracis cornubus lateralibus subobsoletis, cornu postico nullo, abdominis apice suprâ pedibusque fulvis, alis subcinereo-hyalinis, anticis costâ basique nigris.

Female. Black, dull, scabrous. Lateral horns of the thorax almost obsolete; no hind horn. Abdomen tawny towards the base above. Legs tawny. Wings hyaline, slightly greyish; veins black; fore wings black at the base and along the costa. Length of the body $1\frac{3}{4}$ line; of the wings 4 lines.

122. *CENTROTUS CONSOCIUS*, n. s., fœm. Niger obscurus punctulatus, thorace anticè inermi, cornu postico abdominis dimidium superante, pedibus fulvescentibus, alis hyalinis, anticis basi fasciis duabus maculâque subapicali nigris.

Female. Black, dull, minutely punctured. Thorax unarmed in front; hind horn extending to a little beyond half the length of the abdomen. Legs dingy tawny. Wings hyaline; veins pale; fore wings with the base, two irregular bands, and a subapical spot black. Length of the body 1 line; of the wings $2\frac{1}{2}$ lines.

Very nearly allied to *C. semifascia*, *Walk.*

Gen. MICREUNE, *Walk.*

123. *Micreune formidanda*, *Walk.* See page 94.

124. *MICREUNE METUENDA*, n. s., mas et fœm. Atra, thoracis maculis duabus lateralibus posticis testaceis, cornu erecto spinis duabus lateralibus acutis subarcuatis, cornu postico abdominis apicem superante, alis cinereo-hyalinis, venis nigris.

Male and Female. Deep black. Thorax with a testaceous spot on each side hindward; the erect horn armed with two acute, horizontal, slightly curved spines; hind horn extending a little beyond the tip of the abdomen. Wings cinereous hyaline; veins black. Length of the body 3 lines; of the wings 6 lines.

C. dama, Germar, and *C. gazella*, Hoffm., probably belong to this genus.

Fam. CICADELLINA, *Burm.*Trib. LÆVIPEDES, *Amyot et Serv.*Subtrib. CERCOPIDES, *St. Farg. et Serv.*Gen. CERCOPIS, *Fabr.*125. *Cercopis tricolor*, *St. Farg.* See page 94.126. *Cercopis submaculata*, *Walk. Cat. Homopt.* pt. 3. 657. 27.
Inhabits also Java.127. *Cercopis flavifascia*, *Walk. Cat. Homopt.* pt. 3. 654. 16.
Inhabits also Java.128. *Cercopis costalis*, *Walk.* See page 95.

The marks on the thorax and on the fore wings are occasionally white.

129. *Cercopis dorsimacula*, *Walk.* See page 95.130. *Cercopis rugulosa*, *Walk.* See page 95.131. *CERCOPIS SEMIPARDALIS*, n. s. Cuprea pubescens, abdomine subtùs rufo nigro maculato, pedibus rufis, alis anticis fulvis nigro maculatis apice cupreis, posticis cinereis.

Cupreous, pubescent. Abdomen beneath red, with black spots. Legs reddish. Fore wings tawny, with nine black spots; apical third part cupreous. Hind wings cinereous. Length of the body 5 lines; of the wings 14 lines.

132. *CERCOPIS DELINEATA*, n. s., fœm. Nigro-cyanea pubescens, capitis vittâ thoracisque fasciâ posticâ flavis, pedibus rufis, alis anticis purpureo-cupreis luteo trivittatis, posticis cinereis.*Female.* Blackish, pubescent. Head with a lanceolate yellow stripe in front. Scutum with a curved yellow band. Abdomen tawny beneath. Legs red. Fore wings purplish cupreous, with three luteous bands, one along the basal part of the interior border, the other two at right angles to the costa. Hind wings grey. Length of the body 4 lines; of the wings 10 lines.133. *CERCOPIS SEMIROSEA*, n. s. Rufo-lutea, alis anticis testaceis basi costâ-que rufescentibus apice roseis, posticis albidis.

Reddish luteous. Fore wings testaceous, rosy towards the tips, reddish at the base and along the costa. Hind wings whitish. Length of the body 3 lines; of the wings 8 lines.

134. *CERCOPIS UNDULIFERA*, n. s., fœm. Nigra, frontis maculâ thoracis fasciâ et alarum anticarum lineis duabus transversis undulatis testaceis, tibiis tarsisque fulvescentibus, alis posticis cinereis.*Female.* Black. Vertex piceous, with a testaceous border; front with a testaceous spot behind. Thorax with a broad testaceous band. Tibiæ and tarsi dark tawny. Fore wings with two undulating transverse testaceous lines. Hind wings cinereous. Length of the body 3 lines; of the wings 8 lines.135. *CERCOPIS SUBDOLENS*, n. s. Rufa, capite pectore pedibusque nigris, femoribus tibiisque posticis rufis, alis posticis cinereis.

Red. Head, pectus and legs black. Hind femora and hind tibiæ red. Hind wings grey. Length of the body 2 lines; of the wings 6 lines.

Subtrib. APHROPHORIDES, *Amyot et Serv.*Gen. PTYELUS, *St. Farg. et Serv.*136. *Ptyelus amplus*, *Walk. Cat. Homopt.* pt. 3. 706. 11.

Inhabits also Java.

137. *PTYELUS INEFFECTUS*, n. s., fœm. Piceus, tibiis posticis fulvis, alis anticis lineâ transversâ angulosâ subobsoletâ fulvâ, posticis nigro-cinereis.*Female.* Piceous. Pectus with a tawny spot on each side. Hind tibiæ dull tawny. Fore wings with an indistinct transverse zigzag tawny line. Hind wings blackish-grey. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Gen. AMARUSA, n. g.

Corpus longum. *Caput* breve, arcuatum, lateribus vix brevioribus; frons sulcis transversis. *Scutum* anticè impressum, margine postico excavato; scutellum oblanceolatum. *Pedes* brevissimi. *Alæ* longi-fusiformes.*Body* long. Head short, convex in front, concave behind, hardly longer in the middle than on each side; its breadth more than four times its length. Scutum impressed in front; middle part of the hind border excavated; scutellum oblanceolate. Legs very short. Wings elongate-fusiform.138. *AMARUSA PICEA*, n. s. Nigra, capite suprâ thoraceque obscurè fulvis, thorace maculis duabus lateralibus piceis, alis anticis piceis, posticis nigro-cinereis.*Black.* Head above and thorax dark tawny. Thorax with a piceous spot on each side. Fore wings piceous. Hind wings blackish-grey. Length of the body 4 lines; of the wings 10 lines.Gen. PERINOIA, *Walk.*139. *PERINOIA EXCLAMANS*, n. s., fœm. Fusca, capite suprâ thoraceque testaceo septem-vittatis, capite subtùs pectoreque testaceo bivittatis, alis anticis nigro-fuscis vittis tribus basalibus duabusque apicalibus maculisque quatuor intermediis testaceis, posticis cinereis.*Female.* Brown. Head above and scutum with seven testaceous stripes which extend to the scutum and to the interior base of the fore wings. Head beneath and pectus with a testaceous stripe on each side. Fore wings blackish-brown, pale brown like the thorax at the interior base, with three basal and two apical testaceous stripes, and with four intermediate elongated testaceous spots. Hind wings cinereous. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.140. *PERINOIA SIGNIFERA*, n. s., fœm. Nigra, capite suprâ thoraceque testaceis cervino sex-vittatis, capite subtùs pectoreque testaceo bivittatis, pedibus testaceis, alis anticis margine interiore vittâ basali arcuatâ vittisque duabus apicalibus testaceis, posticis cinereis.*Female.* Black, narrower than the preceding species, and with a more conical head. Head above and thorax testaceous, with six fawn-coloured stripes

which extend to the scutum and to the interior border of the fore wings. Head beneath and pectus with a testaceous stripe on each side. Legs testaceous. Fore wings with the interior border, a curved basal stripe, and two apical stripes testaceous. Hind wings cinereous. Length of the body 3 lines; of the wings 6 lines.

141. *PERINOIA EXPRESSA*, n. s., fœm. Nigra, capite subtùs pectoreque albido bivittatis, ventre pedibusque obscurè fulvis, alis anticis maculis duabus strigâque exteriore subarcuatâ albido-testaceis, posticis cinereis.

Female. Black. Head piceous above; under side and pectus with a whitish stripe on each side. Abdomen beneath and legs dark tawny. Fore wings with two whitish testaceous spots, and with an exterior somewhat paler slightly curved streak which joins the costa and extends nearly to the tip of the wing. Hind wings blackish-grey. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Subtrib. *SERRIPEDES*, *Amyot et Serv.*

Coh. *TETTIGONIDES*, *Amyot et Serv.*

Gen. *TETTIGONIA*, *Germar.*

142. *Tettigonia farinosa*, *Fabr.* See page 97.

143. *Tettigonia ferruginea*, *Fabr.* See page 97.

144. *Tettigonia suavissima*, *Walk.* See page 97.

145. *TETTIGONIA ELONGATA*, n. s. Fulva subtùs testacea, capitis disco fascisque duabus anticis necnon scuti maculâ anticâ margineque postico scutellique disco nigris, abdomine nigro, margine fascisque subtùs rufis, pedibus albidis, tibiis tarsisque apice nigris, alis anticis ferrugineis basi fulvo nigro glaucoque maculatis apice posticisque nigricantibus.

Tawny, testaceous beneath. Disk of the head and two bands beneath, a spot in front of the scutum and its hind border, and the disk of the scutellum black. Abdomen black; under side with red bands and a red border. Legs whitish; tips of the tibiæ and of the tarsi black. Fore wings ferruginous, blackish towards the tips, with three spots at the base; 1st spot tawny, 2nd black, 3rd glaucous. Hind wings blackish. Length of the body 6 lines; of the wings 14 lines.

146. *TETTIGONIA LINEOLATA*, n. s. Glauco-nigra, capite subtùs fasciis duabus flavis, pectoris abdominisque lateribus flavis, ventre subtùs fasciâ posticâ flavâ apice albo, pedibus piceis, anticis flavo variis, alis posticis basi cinereis.

Black, with a glaucous tinge. Head beneath with two yellow bands. Pectus and abdomen yellow along each side; the latter with a yellow band near the tip, which is white. Legs piceous; fore legs marked with yellow. Hind wings cinereous hyaline towards the base. Length of the body 6 lines; of the wings 14 lines.

147. *TETTIGONIA ANGULARIS*, n. s. Nigra albo tomentosa subtùs picea,

thorace cupreo, vittis obscurioribus guttisque albis, margine antico nigro, alis anticis cupreo-rufis apice cinereis, posticis nigro-cinereis.

Black, with whitish tomentum, piceous beneath. Thorax cupreous, with darker stripes and with white dots, black along the fore border. Fore wings cupreous red, grey towards the tips, with a dotted pale lilac band at the base. Hind wings blackish-grey. Length of the body 5 lines; of the wings 10 lines.

148. *TETTIGONIA INVADENS*, n. s., fœm. Ochracea, tibiis anticis intus nigro lineatis, alis anticis apice posticisque cupreo-cinereis.

Female. Ochraceous. Fore tibiæ with a black line on the inner side. Fore wings at the tips and hind wings cupreous-cinereous. Length of the body 4 lines; of the wings 10 lines.

149. *TETTIGONIA SCITIPENNIS*, n. s., mas. Lætè flava, subtus nigra, abdomine nigro apice alido, pedibus flavis, alis anticis maculis quatuor fasciâque exteriore nigris, apice cinereis, posticis nigro-cupreis apice cinereis.

Male. Bright yellow, black beneath. Abdomen black, whitish at the tip. Legs yellow. Fore wings with four black spots and with an exterior black band, grey at the tips. Hind wings blackish-cupreous, with grey tips. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

150. *TETTIGONIA LEPIDIPENNIS*, mas. Flava, thorace ochraceo-vittato, abdomine pedibusque albidis, alis anticis æneo-testaceis subhyalinis, maculis quinque elongatis ochraceis, posticis albo-hyalinis.

Male. Yellow. Thorax with an ochraceous stripe. Abdomen and legs whitish. Fore wings æneous testaceous, subhyaline, with five elongated irregular ochraceous spots, the subapical one indistinct. Hind wings white, hyaline. Length of the body 4 lines; of the wings 10 lines.

151. *TETTIGONIA EBURNEA*, n. s., mas et fœm. Albida, capite conico, alis lacteo-albis.

Male and Female. Whitish. Vertex of the head conical. Wings milk-white. Length of the body $2\frac{3}{4}$ lines; of the wings 7 lines.

152. *TETTIGONIA SIGNIFERA*, n. s. Æneo-cinerea, capitis maculis quatuor, thoracis vittis duabus alisque anticis vittâ interruptâ rufis, alis posticis cinereis.

Æneous-cinereous. Head conical, with four red stripes. Thorax with two red stripes and a red dot on the hind border between them. Fore wings with a red stripe composed of five streaks. Hind wings greyish-hyaline. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

153. *TETTIGONIA POLITA*, n. s. Ochracea subtus alido-flava, capite guttis septem thoraceque duabus atris, alis anticis nigris costâ testaceâ margine interiore ochraceo, posticis nigricantibus.

Ochraceous, whitish-yellow beneath. Head with seven black dots, three in front and four behind. Thorax with two black dots. Fore wings black; costa testaceous; interior border ochraceous. Hind wings blackish. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

154. *TETTIGONIA GLABRA*, n. s. Testacea, capite guttis duabus lateralibus

nigris, thorace fulvo, abdomine nigro, alis anticis cupreis, guttis duabus marginalibus testaceis, posticis nigro-cinereis.

Testaceous. Head with a minute black dot on each side near the eye. Thorax tawny. Abdomen black. Fore wings cupreous, shining, with two elongated testaceous dots; one on the costa, opposite to the other which is on the interior border. Hind wings blackish-grey. Length of the body $2\frac{3}{4}$ lines; of the wings 6 lines.

155. *TETTIGONIA INCLINANS*, n. s. Cuprea, capite pedibusque testaceis, capite subtus vittis duabus rufis, abdomine nigro, alis posticis nigricantibus. Cupreous. Head testaceous; front with two red stripes. Abdomen black. Legs testaceous. Hind wings blackish. Length of the body $2\frac{3}{4}$ lines; of the wings 6 lines.

156. *TETTIGONIA DIFFICILIS*, n. s. Nigro-ænea subtus testacea, capitis fasciâ interruptâ thoracis vittis duabus angulatis scutellique guttis ochraceis, pedibus testaceis, alis cinereo-hyalinis, anticis nigricante guttatis.

Blackish-æneous, testaceous beneath. Head with an interrupted ochraceous band. Scutum with an angular ochraceous stripe on each side; scutellum with ochraceous dots. Legs testaceous. Wings greyish-hyaline; fore wings with a blackish dot on each areolet. Length of the body 3 lines; of the wings 6 lines.

Coh. SCARIDES, *Amyot et Serv.*

Gen. LEDRA, *Fabr.*

157. *LEDRA TUBERCULIFRONS*, n. s., fœm. Ferruginosa, capite lato tuberculato, scuto quadricarinato, alis cinereo-subhyalinis, anticis ferrugineo variis tuberculis duobus nigris, areolis plurimis.

Female. Ferruginous, paler beneath. Head short-conical, tuberculated, slightly keeled, much broader than long, with a short oblique ridge on each side behind. Scutum transverse subquadrate, with four keels. Wings cinereous-hyaline; fore wings varied with ferruginous, slightly tuberculated at the base, and with two more distinct black tubercles in the disk; areolets irregular and very numerous. Length of the body 6 lines; of the wings 10 lines.

158. *LEDRA DILATIFRONS*, n. s., fœm. Obscurè ferruginea confertissimè punctata subtus nigra, capite latissimo subtus anticè testaceo, facie flavâ, scuto quadrirugoso, femoribus apice tibiisque albidis, alis posticis cinereis.

Female. Dark ferruginous, very thickly punctured, black beneath. Head and thorax with a slight middle keel. Head a little broader than the thorax, twice broader than long, very obtusely angular in front; disk on each side with an impression containing a black forked line; under side testaceous along the fore border; face yellow. Scutum more than twice broader than long, a little broader in front, with four broad ridges. Legs black; femora towards the tips, tibiæ and posterior tarsi whitish. Fore wings with ridged veins. Hind wings cinereous. Length of the body 5 lines; of the wings 8 lines.

159. *LEDRA TENUIFRONS*, n. s., mas. Cervina albedo varia subtùs albedo-testacea, capite transverso brevi-conico, angulis tribus anticis perobtusis, scuto anticè convexo maculis duabus lateralibus fuscis, scutello maculis duabus fuscis nitidis, abdomine suprà pallidè luteo, alis hyalinis, anticis cervino-venosis basi cervinis punctulatis, posticis nigro-venosis.

Male. Fawn-colour, whitish testaceous beneath. Head and thorax partly whitish. Head very thin, with a slight keel, nearly twice broader than long, with three very obtuse angles in front. Scutum convex and with a brown spot on each side in front; scutellum with a brown shining spot on each side. Abdomen pale luteous above. Legs whitish. Fore wings hyaline, with fawn-coloured veins, fawn-coloured and punctured at the base. Hind wings with black veins. Length of the body $4\frac{1}{2}$ lines; of the wings 7 lines.

160. *LEDRA LONGIFRONS*, n. s., fœm. Ferruginea subtùs sordidè albedo-testacea, capite thorace alisque anticis apud costam testaceo guttatis, capite longi-conico, scuto anticè convexo, abdomine longo, suturis chalybeo-albidis nitentibus, alis anticis vittà discali apicibusque subhyalinis, posticis hyalinis nigro-venosis.

Female. Ferruginous, dingy whitish testaceous beneath. Head, thorax and fore wings along two-thirds of the costa with testaceous dots. Head elongate-conical, rather broader than long, with an almost obsolete keel. Scutum convex in front. Sutures of the abdomen chalybeous-white, shining; tip testaceous. Legs whitish. Fore wings with a discal stripe and with the apical third part nearly hyaline. Hind wings hyaline, with black veins. Length of the body 5 lines; of the wings 8 lines.

161. *LEDRA CONICIFRONS*, n. s. Pallidè fulva subtùs sordidè albedo-testacea, capite thorace alisque anticis confertissimè punctulatis, capite conico, scuto anticè convexo, pedibus albidis, alis anticis testaceis, apicibus posticisque hyalinis.

Pale tawny, dingy whitish testaceous beneath. Head, thorax and fore wings along two-thirds of the length very thickly and minutely punctured. Head and scutum with an indistinct keel; head conical, a little shorter than that of the preceding species; scutum convex in front. Legs whitish. Fore wings testaceous, hyaline towards the tips; veins testaceous. Hind wings hyaline, with black veins. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

162. *LEDRA PLANIFRONS*, n. s., mas. Testaceo-viridis subobsoletè punctulata subtùs viridi-alba, capite scutoque ferrugineo marginatis, illo brevi, hujus lateribus angulatis, abdomine pallidè rufo, pedibus albidis, alis posticis albedo-hyalinis venis albis.

Male. Testaceous-green, very minutely punctured, greenish-white beneath. Head and scutum with a ferruginous border. Head rounded in front, full thrice broader than long, indistinctly keeled. Scutum hardly convex in front, slightly concave behind, with a distinct angle on each side. Abdomen pale red. Legs whitish. Fore wings more green than the thorax. Hind wings whitish-hyaline, with white veins. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

163. *LEDRA ARCUATIFRONS*, n. s. Pallidè viridis subobsoletè punctulata subtùs albida, capite conico, scuto anticè non convexo posticè vix concavo, pedibus albidis, alis posticis albo-hyalinis venis albis.

Pale green, whitish beneath. Head and scutum with an almost obsolete furrow. Head conical, very much broader than long. Scutum not convex in front, very slightly concave behind. Legs whitish. Fore wings greyish towards the tips; hind wings whitish-hyaline, with white veins. Length of the body 4 lines; of the wings $7\frac{1}{2}$ lines.

164. *LEDRA RANIFRONS*, n. s., mas. Ferruginea, capite subtùs abdomineque rufis, thorace fasciâ posticâ viridi piceo marginatâ, pectore pedibusque testaceis, alis anticis fulvis, margine postico viridi strigâ exteriore fuscâ, posticis cinereis.

Male. Ferruginous. Head short-conical, much more than twice broader than long, red beneath. Scutum hardly convex in front, green along the hind border, and with an intermediate transverse piceous line. Pectus and legs testaceous. Abdomen red. Fore wings tawny, green along the hind border, and with a brown streak towards the tip which is paler. Hind wings cinereous, with black veins. Length of the body 3 lines; of the wings 6 lines.

165. *LEDRA OBTUSIFRONS*, n. s., fœm. Viridis lata subtùs testacea, capite brevi subtùs ferrugineo, scutello fusco, alis anticis lineâ basali aream pallidam includente fasciâque subapicali fuscis, posticis hyalinis nigro-venosis.

Female. Green, broad, testaceous beneath. Head much more than twice broader than long, rounded in front, ferruginous beneath. Scutum hardly convex in front and as little concave behind; scutellum brown. Fore wings with a brown basal line including a pale space along the hind border, and with a brown subapical band. Hind wings hyaline, with black veins. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

166. *LEDRA TRUNCATIFRONS*, n. s., mas. Picea lata punctulata subtùs nigra, capite perbrevis, abdomine basi pedibusque testaceis, alis anticis apice pallidioribus, posticis cinereis nigro-venosis.

Male. Piceous, broad, black beneath. Head, thorax and fore wings very minutely punctured. Head about four times broader than long. Scutum short. Abdomen at the base and legs testaceous. Fore wings paler at the tips. Hind wings greyish-hyaline, with black veins. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Gen. EPICLINES, *Amyot et Serv.*

167. *EPICLINES OBLIQUA*, n. s. Viridis subtùs testacea, capite conico, scuto fasciis duabus anticis rufis posticè fusco, scutello et alarum anticarum margine postico basi vittâque discali obliquâ luteis, alis posticis cinereo-hyalinis nigro-venosis.

Green, testaceous beneath. Head conical, indistinctly keeled, nearly twice broader than long. Scutum obtusely angular on each side, with two red bands in front, brown along the hind border. Scutellum luteous. Fore wings luteous along the hind border towards the base, and with an oblique

luteous band which extends from the base of the costa to nearly two-thirds of the length of the hind border. Hind wings cinereous-hyaline, with black veins. Length of the body 7 lines; of the wings 14 lines.

Gen. ISACA, n. g.

Corpus breve. *Caput* transversum, convexum; frons transversa; facies transversa, trigona. *Antennæ* brevissimæ; arista gracillima, corporis dimidio longior. *Pedes* anteriores breves; postici longi, tibiis spinosissimis. *Alæ* sat angustæ, venis paucis.

Body short. Head transverse, convex; vertex short; front and face transverse, the latter triangular. *Antennæ* very short; arista very slender, more than half the length of the body. Anterior legs short; hind legs long; their tibiæ very spinose. Wings rather narrow, with few veins.

168. ISACA BIPARS, n. s. Nigra nitens glabra, facie pectore abdomine pedibusque albidis, alis hyalinis, anticis strigâ latâ basali fasciâque latissimâ exteriore nigro-fuscis, posticis disco nigro-fusco.

Black, shining, smooth. Face, pectus, abdomen and legs whitish. Wings hyaline. Fore wings with a broad blackish-brown basal streak, and with a very broad exterior blackish-brown band. Hind wings with a blackish-brown disk. Length of the body $1\frac{1}{2}$ line; of the wings 4 lines.

Coh. IASSIDES, Amyot et Serv.

Gen. ACOCEPHALUS, Germar.

169. Acocephalus olivaceus, Walk. See page 98.

170. Acocephalus stramineus, Walk. Cat. Homopt. pt. 3. 847. 2. Inhabits also Java.

171. ACOCEPHALUS DISCIGUTTA, n. s., mas. Testacea brevis, abdominis dorso nigro, alis anticis albis fusco reticulatis, maculâ discali nigrâ, plagâ posticâ testaceâ, posticis hyalinis albo-venosis.

Male. Testaceous, short. Abdomen black above. Fore wings white, with brown transverse marks which are most frequent at the tips; a black discal spot and a posterior testaceous patch. Hind wings quite hyaline, with white veins. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Gen. CÆLIDIA, Germar.

172. CÆLIDIA DIRIGENS, n. s., fœm. Fusca subtùs alba, vertice albo anticè nigro, capite subtùs fasciis ferrugineis, scuto albo consperso, abdomine nigro-vario, tibiis tarsisque apice albis, alis anticis maculis nigris albisque, venis albo punctatis.

Female. Brown, white beneath. Vertex white, black along the fore border; front with three ferruginous bands. Scutum sprinkled with white. Abdomen varied with black. Tibiæ and tarsi with black tips. Fore wings slightly mottled, with black costal spots, and with white hyaline discal spots; veins with white dots. Length of the body $3\frac{1}{4}$ lines; of the wings 7 lines.

173. *CÆLIDIA PARDALIS*, n. s. Fulva subtùs testacea, fronte facieque vittis duabus rufis, alis anticis fuscis maculis variis luridis, posticis cinereis.

Tawny, testaceous beneath. Front and face with two red stripes. Fore wings brown, with lurid spots of various size and shape. Hind wings grey. Length of the body 3 lines; of the wings 6 lines.

174. *CÆLIDIA ALBISIGNA*, n. s. Nigra, capite albido, facie nigrâ, abdominis segmentis albido marginatis, tibiis anterioribus albidis, alis anticis nigro-fuscis, guttis plurimis luridis maculis quatuor marginalibus albis, posticis cinereis.

Black. Head whitish; face black. Segments of the abdomen with whitish borders. Tarsi whitish, with black tips; anterior tarsi whitish; hind tibiæ partly whitish. Fore wings with several lurid dots, with two irregular white spots on the costa, and with two more on the interior border. Hind wings grey. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

175. *CÆLIDIA CUPRARIA*, n. s., fœm. Testacea, capite subtùs fulvo bivittato, pectore plagis quatuor nigris, alis anticis nigro-cupreis costâ testaceâ, posticis nigro-cinereis.

Female. Testaceous. Front and face with two tawny stripes. Pectus black; segments with testaceous borders. Legs tawny. Fore wings blackish-cupreous; costa testaceous. Hind wings blackish-grey. Length of the body 4 lines; of the wings 8 lines.

Gen. BYTHOSCOPIUS, Germar.

Group 1. *Arista brevis*. *Arista short*.

176. *Bythoscopus ferrugineus*, Walk. Cat. Homopt. pt. 3. 865. 31.

Inhabits also Java.

177. *BYTHOSCOPIUS TESTACEUS*, n. s., mas. Luteo-testaceus nitens subtùs pallidè testaceus, capite brevi, thorace subpunctulato, abdominis segmentis rufo marginatis apice rufo, alis anticis apice cinereo-hyalinis, posticis nigro-cupreis.

Male. Luteous-testaceous, shining, pale testaceous beneath. Head very little longer in the middle than on each side. Thorax very minutely punctured. Abdominal segments with red borders; tip red. Fore wings greyish-hyaline towards the tips. Hind wings blackish-cupreous. Length of the body 4 lines; of the wings 8 lines.

178. *BYTHOSCOPIUS METALLICUS*, n. s., fœm. Cupreus subtùs ferrugineus, capite fulvo brevissimo latissimo, vertice scutoque anticè testaceis, illius margine antico nigro, alis anticis fasciâ maculâque exteriore discali albido-hyalinis, posticis nigro-cinereis.

Female. Cupreous; ferruginous beneath. Head tawny, very short and broad; vertex with a black line along the fore border which is testaceous. Scutum testaceous in front. Fore wings with a whitish-hyaline band, and with an exterior discal spot of the same hue. Hind wings blackish-grey. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

179. *BYTHOSCOPIUS LATERALIS*, n. s. Cupreus subtùs fulvus, capite brevi-

conico lineâ anticâ transversâ nigrâ, alis anticis apices versus cinereo-notatis, strigis duabus costalibus hyalinis, posticis nigro-cinereis.

Cupreous, tawny beneath. Head short-conical, rather longer than in most species of the genus; vertex with a transverse black line in front. Fore wings towards the tips with some cinereous marks and with two more distinct hyaline costal streaks. Hind wings blackish-grey. Length of the body 2 lines; of the wings 4 lines.

180. *BYTHOSCOPIUS CEPHALOTES*, n. s. Pallidè flavus, capitis disco testaceo, punctis duobus anticis nigris, strigis duabus subtùs facieque nigris, abdomine testaceo, alis anticis fulvis, margine postico basi pallidè flavo, posticis cinereo-hyalinis.

Pale yellow. Head testaceous in the disk above, with two minute black dots in front, and with two black streaks towards the face, which is also black. Abdomen testaceous. Fore wings tawny, pale yellow at the base of the hind border. Hind wings greyish-hyaline. Length of the body $1\frac{1}{4}$ line; of the wings 3 lines.

Group 2. *Arista perlonga*. *Arista very long*.

181. *BYTHOSCOPIUS BIARCTATUS*, n. s., fœm. Albido-testaceus, vertice scutoque lineâ transversâ arcuatâ rufâ, alis anticis maculis duabus costalibus exterioribus apiceque fuscis, posticis subhyalinis pallido-venosis.

Female. Whitish-testaceous. Head arched, about four times broader than long, a little more convex in front than concave behind. Vertex and scutum each with a transverse red arched line. Arista about three-fourths of the length of the body. Fore wings with brown tips, and with two exterior brown costal spots. Hind wings nearly hyaline, with brown tips. Length of the body $2\frac{1}{2}$ lines; of the wings $5\frac{1}{2}$ lines.

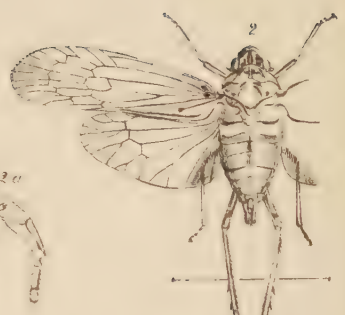
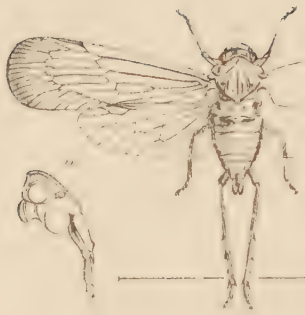
182. *BYTHOSCOPIUS LETISIGNA*, n. s., mas. et fœm. Cinereo-cupreus subtùs cinereus, capitis lineâ anticâ thoracis fasciâ anticâ interruptâ arcuatâ maculisque posticis ochraceis, tibiis anticis ochraceis, alis cupreo-hyalinis, anticis costâ ochraceâ maculis duabus exterioribus costalibus apiceque nigro-fuscis.

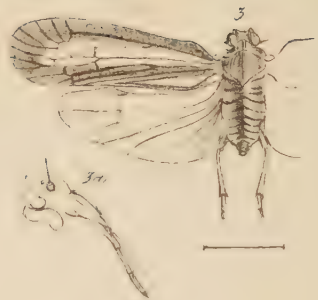
Male and Female. Cupreous, with a cinereous tinge; cinereous beneath. Head with an ochraceous line in front of the vertex. Arista about half the length of the body. Thorax with an arched interrupted ochraceous band and some hinder ochraceous spots. Fore tibiæ and tips of the fore femora ochraceous. Wings cupreous-hyaline. Fore wings with the costa and the interior border ochraceous, with two exterior blackish-brown costal lines, with blackish-brown tips, and with a blackish-brown dot by the interior border. Length of the body 3 lines; of the wings 7 lines.

183. *BYTHOSCOPIUS NIGRILINEA*, n. s. Æneo-fulvus, capite lineis duabus transversis nigris, alis anticis æneo-luridis, guttis tribus apud marginem posticum nigris.

Æneous-tawny. Head with two black transverse lines. Arista a little more than half the length of the body. Wings lurid, with an æneous tinge; interior border of the fore wings with three black dots. Length of the body $2\frac{1}{4}$ lines; of the wings 6 lines.







184. *BYTHOSCOPIUS IGNICANS*, n. s. Ochraceous subtus testaceus, scutello albo, alis anticis guttis discalibus maculisque marginalibus albis, maculis apicalibus fuscis, posticis cinereis.

Ochraceous, testaceous beneath. Arista longer than the body. Scutellum white. Legs testaceous. Fore wings with white brown-bordered discal dots, and with some white spots on the costa and on the interior border; disks of the exterior areolets brown. Hind wings grey. Length of the body $1\frac{1}{2}$ line; of the wings 4 lines.

DESCRIPTION OF PLATE VI., illustrating New Genera of Bornean *Diptera*, described in Mr. WALKER's Memoir, pp. 105-136.

PLATE VI.

- Fig. 1. *Culcua simulans*, magnified, p. 109: 1 *a*, the head seen sideways; 1 *b*, the antenna more strongly magnified.
 Fig. 2. *Evaza bipars*, magnified, p. 109: 2 *a*, the head seen sideways, showing the large facets of the eyes; 2 *b*, the antenna.
 Fig. 3. *Citibæna aurata*, magnified, p. 124, showing the spinose posterior femora: 3 *a*, the head seen in front; 3 *b*, the same seen sideways; 3 *c*, the antenna.
 Fig. 4. *Baryterocera inclusa*, magnified, p. 123: 4 *a*, the head seen sideways; 4 *b*, the same seen in front; 4 *c*, the antenna.
 Fig. 5. *Gauzania depecta*, magnified, p. 130, showing the large middle legs: 5 *a*, the head seen in front; 5 *b*, the same seen sideways; 5 *c*, the antenna.

ILLUSTRATIVE DESCRIPTION OF PLATES VII. & VIII. of Bornean *Homoptera*, described in the foregoing Paper.

PLATE VII.

- Fig. 1. *Leusaba marginalis*, p. 144: 1 *a*, the head and prothorax seen sideways.
 Fig. 2. *Isporisa apicalis*, p. 145: 2 *a*, the head and prothorax seen sideways.
 Fig. 3. *Epora subtilis*, p. 146: 3 *a*, the head and prothorax seen sideways.
 Fig. 4. *Ostama juncta*, p. 151: 4 *a*, upper wing; 4 *b*, face seen in front.
 Fig. 5. *Erana operosa*, p. 151: 5 *a*, upper wing; 5 *b*, face seen in front.
 Fig. 6. *Rhotala delineata*, p. 152: 6 *a*, the head and prothorax seen sideways.
 Fig. 7. *Hiracia ignava*, p. 155: 7 *a*, the head and prothorax seen sideways; 7 *b*, the fore and hind wings expanded.
 Fig. 8. *Lerida fervens*, p. 158: 8 *a*, head and prothorax seen sideways.

PLATE VIII.

- Fig. 1. *Paricana dilatipennis*, p. 159: 1 *a*, head and prothorax seen sideways.
 Fig. 2. *Rhotana latipennis*, p. 160: 2 *a*, head and prothorax seen sideways.
 Fig. 3. *Eucarpia univitta*, p. 159: 3 *a*, head and prothorax seen sideways.
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JOURNAL
OF
THE PROCEEDINGS
OF
THE LINNEAN SOCIETY.

ZOOLOGY.

VOL. II.

LONDON:
LONGMAN, BROWN, GREEN, LONGMANS & ROBERTS,
AND
WILLIAMS AND NORRIS.
1858.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

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JOURNAL OF THE PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

On the Characters, Principles of Division, and Primary Groups of the Class MAMMALIA. By Professor OWEN, F.R.S., F.L.S., Superintendent of the Natural History Departments in the British Museum.

[Read February 17th and April 21st, 1857.]

THE class MAMMALIA, the most highly organized of the animal kingdom and that to which we ourselves belong, appears to have been the last class of animals introduced on this planet, and not to have attained plenary development until the tertiary division of geological time.

MAMMALS are distinguished, outwardly, by an entire or partial covering of hair, and (with two exceptions) by teats or mammæ—whence the name of the class*. All Mammals possess mammary glands, and suckle their young: the embryo or foetus is developed in the womb. Their leading anatomical character is to have lungs, composed of a highly vascular and minutely cellular structure throughout, and suspended freely in a thoracic cavity separated by a muscular and tendinous septum or diaphragm from the abdomen.

* From *mamma*, a pap. The Platypus and Echidna are the only known exceptions to this rule. The Mare is an apparent one, from the pudendal position of the nipples. The foetal Cetacea show tufts of hair on the muzzle.

Mammals, like Birds, have a heart composed of two ventricles and two auricles, and have warm blood: they breathe quickly; but inspiration is performed chiefly by the agency of the diaphragm; and the inspired air acts only on the capillaries of the pulmonary circulation.

The blood-discs are smaller than in Reptiles, and, save in the Camel-tribe, are circular. The right auriculo-ventricular valve is membranous, at least never entirely fleshy; and the aorta bends over the left, never over the right, bronchial tube. The primary branches of the aorta are given off not immediately after, but at a little distance from, its origin, and there is less constancy in the order of their origin than in Birds: the phrenic arteries, the coeliac axis, and the superior mesenteric artery are always branches of the abdominal aorta, which terminates by dividing beyond the kidneys into the iliac arteries, from which spring both the femoral and ischiadic branches: the caudal or sacro-median artery, which in some long-tailed Mammals assumes the character of the continued trunk of the aorta, never distributes arteries to the kidneys or the legs, as in Birds. The kidneys are nourished, and derive the material of their secretion, exclusively from the arterial system. Their veins are simple, commencing by minute capillaries in the parenchyma and terminating generally by a single trunk on each side in the abdominal vena cava: they never anastomose with the mesenteric veins.

The kidneys are relatively smaller and present a more compact figure than in the other vertebrate classes; their parenchyma is divided into a cortical and medullary portion, and the secreting tubuli terminate in a dilatation of the excretory duct, called the pelvis.

The liver is generally divided into a greater number of lobes than in Birds. The portal system is formed by veins derived exclusively from the spleen and chylopoietic viscera. The cystic duct, when it exists, always joins the hepatic, and does not enter the duodenum separately. The pancreatic duct is commonly single.

The mouth is closed by soft flexible muscular lips: the upper jaw is composed of palatine, maxillary and premaxillary bones, and is fixed; the lower jaw consists of two rami, which are simple or formed by one bony piece, and are articulated by a convex or flat condyle to the base of the zygomatic process, and not to the tympanic element of the temporal bone; the base of the coronoid process generally extends along the space between the condyloid

and the alveolar processes. The jaws of Mammals with few exceptions are provided with teeth, which are arranged in a single row; they are always lodged in sockets, and never ankylosed with the substance of the jaw. The tongue is fleshy, well-developed, with the apex more or less free. The posterior nares are protected by a soft palate, and the larynx by an epiglottis: the rings of the trachea are generally cartilaginous and incomplete behind: there is no inferior larynx. The œsophagus is continued without partial dilatations to the stomach, which varies in its structure according to the nature of the food, or the quantity of nutriment to be extracted therefrom.

The true vertebræ of Mammalia have their bodies ossified from three centres, and present for a longer or shorter period of life a discoid epiphysis at each extremity. They are articulated by concentric ligaments with interposed glairy fluid forming what are called the intervertebral substances; the articulating surfaces are generally flattened, but sometimes, as in the neck of certain Ruminants, they are concave behind and convex in front: such a vertebra, however, may be distinguished from a vertebra of a Reptile, with a similar ball-and-socket structure of the articular surfaces, even when found in a fossil state, and when the test of the articulating medium cannot be applied, by the complete ankylosis or confluence of the annular with the central part or body, and by the large relative size of the canal for the spinal chord. The cervical vertebræ, with one or two exceptions, are seven in number, neither more nor less: the Monotremes, which are the instances commonly opposed to other generalizations, form no exception to this rule. The lumbar vertebræ are more constant and usually more numerous than in other classes of vertebrate animals. The atlas is articulated by concave articular processes to two convex condyles, which are developed from the ex-occipital elements of the last cranial vertebra. The tympanic element of the temporal bone is restricted in function to the service of the organ of hearing, and never enters into the articulation of the lower jaw. The olfactory nerves escape from the cranial cavity through numerous foramina of a cribriform plate. The optic foramina are always distinct from one another.

The scapula is generally an expanded plate of bone; the coracoid, with two (monotrematous) exceptions, appears as a small process of the scapula. The sternum consists of a narrow and usually simple series of bones: the sternal portions of the ribs are generally cartilaginous and fixed to the vertebral portions without

the interposition of a distinct articulation: there are no gristly or bony abdominal ribs or abdominal sternum. The pubic and ischial arches are generally complete, and united together by bony confluence on the sternal aspect, so that the interspace of the two pelvic arches is converted into two holes, called *foramina obturatoria* or *thyroidea*. The sclerotic coat of the eye is a fibrous membrane, and never contains bony plates. In the quantity of aqueous humour and the convexity of the lens Mammals are generally intermediate between Birds and Fishes. The organ of hearing is characterized by the full development of the cochlea with a lamina spiralis: there are three distinct ossicles in the tympanum; the membrana tympani is generally concave externally; the meatus auditorius externus often commences with a complicated external ear, having a distinct cartilaginous basis. The external apertures of the organ of smell are provided with moveable cartilages and muscles, and the extent of the internal organ is increased by accessory cavities or sinuses which communicate with the passages including the turbinated bones.

There are few characters of the osseous system common, and at the same time peculiar, to the class Mammalia. The following may be cited:—

1. Each half or ramus of the mandible consists of one bony piece developed from a single centre: the condyle is convex or flat, never concave. This has proved a valuable character in the determination of fossils.

2. The second or distal bone, called “squamosal,” in the bar continued backwards from the maxillary arch, is not only expanded, but is applied to the side-wall of the cranium, and developes the articular surface for the mandible, which surface is either concave or flat*.

3. The presphenoid is developed from a centre distinct from that of the basisphenoid.

In no other class of vertebrate animals are these osteological characters present.

The cancellous texture of mammalian bone is of a finer and more delicate structure than in Reptiles, and forms a closer network than in Birds. The microscopic radiating cells are relatively smaller and approach more nearly to the spheroid form; but both these histological characters are liable to mislead, if unsupported by more obvious and constant ones, in the interpretation of a fossil.

* The Wombat is, perhaps, the sole exception to this rule.

Dental characters.—The Mammalia, like *Reptilia* and *Pisces*, include a few genera and species that are devoid of teeth; the true ant-eaters (*Myrmecophaga*), the scaly ant-eaters or pangolins (*Manis*), and the spiny monotrematous ant-eater (*Echidna*), are examples of strictly edentulous Mammals. The Ornithorhynchus has horny teeth, and the whales (*Balæna* and *Balænoptera*) have transitory embryonic calcified teeth, succeeded by whalebone substitutes in the upper jaw. The female Narwhal seems to be edentulous, but has the germs of two tusks in the substance of the upper jaw-bones; one of these becomes developed into a large and conspicuous weapon in the male Narwhal, whence the name of its genus *Monodon*.

The examples of excessive number of teeth are presented, in the order *Bruta*, by the priodont Armadillo, which has ninety-eight teeth: and in the Cetaceous order by the Cachalot, which has upwards of sixty teeth, though most of them are confined to the lower jaw; by the common Porpoise, which has between eighty and ninety teeth: by the Gangetic Dolphin, which has one hundred and twenty teeth; and by the true Dolphins (*Delphinus*), which have from one hundred to one hundred and ninety teeth, yielding the maximum number in the class Mammalia.

When the teeth are in excessive number, as in the Armadillos and Dolphins above cited, they are small, equal, or sub-equal, and usually of a simple conical form.

In most other mammals particular teeth have special forms for special uses; thus, the front teeth, from being commonly adapted to effect the first coarse division of the food, have been called cutters or *incisors*; and the back teeth, which complete its comminution, grinders or *molars*; large conical pointed teeth situated behind the incisors, and adapted, by being nearer the insertion of the biting muscles, to act with greater force, are called holders, tearers, laniaries, or more commonly *canines*, from being well developed in the Dog and other Carnivora.

It is peculiar to the class Mammalia to have teeth implanted in sockets by two or more fangs; but this can only happen to teeth of limited growth, and generally characterizes the molars and premolars: perpetually growing teeth require the base to be kept simple and widely excavated for the persistent pulp. In no mammiferous animal does ankylosis of the tooth with the jaw constitute a normal mode of attachment. Each tooth has its peculiar socket, to which it firmly adheres by the close co-adaptation of their opposed surfaces, and by the firm adhesion of the alveolar

periosteum to the organized cement which invests the fang or fangs of the tooth.

True teeth implanted in sockets are confined, in the Mammalian class, to the maxillary, premaxillary, and mandibular or lower maxillary bones, and form a single row in each. They may project only from the premaxillary bones, as in the Narwhal; or only from the lower maxillary bone, as in *Ziphius*; or be limited to the superior and inferior maxillaries and not present in the premaxillaries, as in the true *Ruminantia* and most *Bruta* (Sloths, Armadillos, Orycteropes). In most Mammals teeth are situated in all the bones above mentioned.

The teeth of the Mammalia usually consist of hard unvascular dentine, defended at the crown by an investment of enamel, and everywhere surrounded by a coat of cement.

The coronal cement is of extreme tenuity in Man, Quadrumana and the terrestrial Carnivora; it is thicker in the Herbivora, especially in the complex grinders of the Elephant.

Vertical folds of enamel and cement penetrate the crown of the tooth in the ruminating and many other Ungulata, and in most Rodents, characterizing by their various forms the genera of those orders.

No Mammal has more than two sets of teeth. In some species the tooth-matrix does not develope the germ of a second tooth, destined to succeed one into which the matrix has been converted; such a tooth, therefore, when completed and worn down, is not replaced. The Sperm Whales, Dolphins, and Porpoises are limited to this simple provision of teeth. In the Armadillos and Sloths, the want of generative power, as it may be called, in the matrix is compensated by the persistence of the matrix, and by the uninterrupted growth of the teeth.

In most other Mammalia, the matrix of the first-developed tooth gives origin to the germ of a second tooth, which sometimes displaces the first, sometimes takes its place by the side of the tooth from which it has originated.

All those teeth which are displaced by their progeny are called 'temporary,' deciduous, or milk-teeth; the mode and direction in which they are displaced and succeeded, viz. from above downwards in the upper, from below upwards in the lower, jaw, in both jaws vertically—are the same as in the Crocodile; but the process is never repeated more than once in any mammalian animal. A considerable proportion of the dental series is thus changed; the second or 'permanent' teeth having a size and form as suitable

to the jaws of the adult, as the 'temporary' teeth were adapted to those of the young animal.

Those permanent teeth, which assume places not previously occupied by deciduous ones, are always the most posterior in their position, and generally the most complex in their form. The term 'molar' or 'true molar' is restricted to these teeth. The teeth between them and the canines are called 'premolars;' they push out the milk-teeth that precede them, and are usually of smaller size and simpler form than the true molars.

Thus the class Mammalia, in regard to the times of formation and the succession of the teeth, may be divided into two groups, *monophyodonts**, or those that generate a single set of teeth; and the *diphyodonts*†, or those that generate two sets of teeth. But this dental character is not so associated with other organic characters as to indicate natural or equivalent subclasses.

In the Mammalian orders with two sets of teeth, these organs acquire fixed individual characters, receive special denominations, and can be determined from species to species. This individualization of the teeth is eminently significative of the high grade of organization of the animals manifesting it.

Originally, indeed, the names 'incisors,' 'canines,' and 'molars,' were given to the teeth, in Man and certain Mammals, as in Reptiles and Fishes, in reference merely to the shape and offices indicated by these names; but they are now used as arbitrary signs, in a more fixed and determinate sense. In some Carnivora, *e. g.* the front-teeth have broad tuberculate summits, adapted for nipping and bruising, while the principal back-teeth are shaped for cutting, and work upon each other like the blades of scissors. The front-teeth in the Elephant project from the upper jaw, in the form, size and direction of long pointed horns. In short, shape and size are the least constant of dental characters in the Mammalia; and the homologous teeth are determined, like other parts, by their relative position, by their connexions, and by their development.

Those teeth which are implanted in the premaxillary bones, and in the corresponding part of the lower jaw, are called 'incisors,' whatever be their shape or size. The tooth in the maxillary bone, which is situated at or near to the suture with the premaxillary, is the 'canine,' as is also that tooth in the lower jaw, which, in opposing it, passes in front of the upper one's crown when the

* *μόνος*, once; *φύω*, I generate; *ὀδούς*, tooth.

† *δὲς*, twice; *φύω* and *ὀδοῦς*. See "Philosophical Transactions," 1850, p. 493.

mouth is closed. The other teeth of the first set are the 'deciduous molars;' the teeth which displace and succeed them vertically are the 'premolars;' the more posterior teeth, which are not displaced by vertical successors, are the 'molars' properly so called.

I have been led, chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous Mammalia, which flourished during the eocene tertiary periods, to regard 3 incisors, 1 canine, and 7 succeeding teeth, on each side of both jaws, as the type formula of diphyodont dentition.

Three of the seven teeth may be 'premolars,' and four may be true 'molars;' or there may be four premolars, and three true molars. This difference, as I have elsewhere shown, forms a character of a secondary group or order in the mammalian class*. The essential nature of the distinction is as follows: true molars are a backward continuation of the first series of teeth; they are developed in the same primary groove of the foetal gum; they are 'permanent' because they are not pushed out by successional teeth—the 'premolars,' called 'dents de remplacement' by Cuvier. Seven teeth developed in the primary groove is, therefore, the typical number of first teeth, beyond the canines. If, as in *Didelphys*, the anterior three develop tooth-germs, which come to perfection in a 'secondary groove,' there are then 3 deciduous teeth, 3 premolars, and 4 true molars: if, as in *Gymnura*, the anterior four of the 'primary' teeth develop tooth-germs, which grow in a secondary groove, there are then 4 deciduous teeth, 4 premolars, and 3 true molars. The first true molar of the marsupial is thus seen to be the homologue of the last milk-molar of the placental.

The *Gymnure*, the Mole, and the Hog are among the few existing quadrupeds which retain the typical number and kinds of teeth. In a young Hog of ten months, the first premolar, *p. 1*, and the first molar, *m. 1*, are in place and use together with the three deciduous molars, *d. 2*, *d. 3*, and *d. 4*; the second molar, *m. 2*, has just begun to cut the gum; *p. 2*, *p. 3*, and *p. 4*, together with *m. 3*, are more or less incomplete, and will be found concealed in their closed alveoli†.

The last deciduous molar, *d. 4*, has the same relative superiority of size to *d. 3* and *d. 2*, which *m. 3* bears to *m. 2* and *m. 1*; and the

* Outlines of a Classification of the Mammalia, Trans. Zool. Soc. vol. ii. p. 330 (1839).

† I recommend this easily acquired 'subject' to the young zoologist for a demonstration of the most instructive peculiarities of the mammalian dentition. He will see that the premolars must displace deciduous molars in order to rise into place: the molars have no such relations.

crowns of *p. 3* and *p. 4* are of a more simple form than those of the milk-teeth, which they are destined to succeed. When the milk-teeth are shed, and the permanent ones are all in place, their kinds are indicated, in the genus *Sus*, by the following formula:—

$$i. \frac{3-3}{3-3}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{4-4}{4-4}, \quad m. \frac{3-3}{3-3} = 44:$$

which signifies that there are on each side of both upper and lower jaws 3 incisors, 1 canine, 4 premolars, and 3 molars, making in all 44 teeth, each tooth being distinguished by its appropriate symbol, e. g., *p. 1* to *p. 4*, *m. 1* to *m. 3*. This number of teeth is never surpassed in the placental Diphyodont series.

When the premolars and the molars are below this typical number, the absent teeth are missing from the fore part of the premolar series, and from the back part of the molar series. The most constant teeth are the fourth premolar and the first true molar; and these being known by their order and mode of development, the homologies of the remaining molars and premolars are determined by *counting the molars from before backwards*, e. g. 'one,' 'two,' 'three,' and the premolars *from behind forwards*, 'four,' 'three,' 'two,' 'one.' The incisors are counted from the median line, commonly the foremost part, of both upper and lower jaws, outwards and backwards. The first incisor of the right side is the homotype, transversely, of the contiguous incisor of the left side in the same jaw, and vertically, of its opposing tooth in the opposite jaw; and so with regard to the canines, premolars, and molars; just as the right arm is the homotype of the left arm in its own segment, and also of the right leg of a succeeding segment. It suffices, therefore, to reckon and name the teeth of one side of either jaw in a species with the typical number and kinds of teeth, e. g. the first, second, and third incisors,—the first, second, third, and fourth premolars,—the first, second, and third molars; and of one side of both jaws in any case.

I have been induced to dwell thus long on the dental characters of the class *Mammalia*, because they have not been clearly or accurately defined in any systematic or elementary work on zoology, although an accurate formula and notation of the teeth are of more use and value in characterizing genera in this than in any other class of animals.

I next proceed to review briefly the principal primary divisions of the *Mammalia* hitherto proposed. The best authorities in Natural History have adopted different characters, drawn from different systems of organs, for the primary groups or divisions of the class *Mammalia*.

Aristotle chose the locomotive system, and divided his ZOOTOKA—the equivalent of the Linnean MAMMALIA—into three sections:—1st, DIPODA, or bipeds; 2nd, TETRAPODA, or quadrupeds; and 3rd, APODA, or impeds. The preponderating second group, which includes all the class save the Human-kind and the Whale-tribe, is subdivided into those with claws, and those with hoofs. The unguiculate quadrupeds are again subdivided according to the nature of their teeth; the ungulate quadrupeds, according to the divisions of their hoofs, as *e. g.* into *Polyschidæ*, or multungulates, *Dischidæ*, or bisulcates, and *Aschidæ*, or solidungulates. I need scarcely remark that this, in most respects admirable, system, would have commanded greater attention, and been now recognized as more manifestly the basis of later systems, had its immortal author more technically expressed his appreciation of the law of the subordination of characters; but he applies to each of his groups, whatever their value, the same denomination, viz. *genos*, or genus.

Ray, with a less philosophical appreciation of the extent and nature of the class *Zootoka* or *Mammalia*, arranges his equivalent group of “Viviparous Four-footed Animals” chiefly on the Aristotelian characters; the primary division being into UNGULATE and UNGUICULATE, and the subdivisions being based on locomotive and dental characters.

Linnaeus, restoring the class *Mammalia* to its Aristotelian integrity, primarily subdivides it into UNGUICULATA, UNGULATA, and MUTICA, the latter being the ‘Apoda’ of Aristotle: the secondary groups or orders are founded chiefly on modifications of the dental system.

Cuvier, adopting the same threefold primary division of the class, subdivides it into better and more naturally defined orders, according to various characters derived from the dental, the osseous, generative, and the locomotive systems.

Illiger, in primarily dividing the *Mammalia* into those with free, and those with fettered limbs—the ‘*pedes exerti distincti*,’ contrasted with the ‘*pedes retracti obvoluti*,’—made a more unequal and less natural partition than the threefold one of Aristotle; the Seals and the Whales balance all the rest of the class in the Illigerian system. The subdivisions, also, of these primary groups, based exclusively on characters of locomotion, have met with little acceptance beyond some of the schools of Germany.

De Blainville appears first, 1816, to have adopted a character from the reproductive system for the primary division of the *Mammalia*, viz. into the ‘*Monodelphes*,’ ‘*Didelphes*,’ and ‘*Ornitho-*

delphes.' His orders are in the main a return to the Linnean system and nomenclature, with some peculiar views, as *e.g.* of the quadrumanous or primatial affinity of the Sloths, which have never gained acceptance. But his system indicates a clearer appreciation or stronger conviction of the value of the character of parity and imparity in the number of toes of the *Ungulata*, first suggested by Cuvier*, than was subsequently entertained by the originator of the idea.

The position of the marsupial and monotrematous quadrupeds at the bottom of the class *Mammalia*, and the higher value assigned to the group which they constituted, than that in the 'Règne Animal' of Cuvier, were ideas also in closer conformity with nature. They were, however, but surmises, unsustained by anatomical knowledge; and, as such, failed to carry conviction, or gain acceptance. Nor was it until comparative anatomy had shown that the Marsupials and Monotremes agreed in differing from all other mammals in the absence of a placenta, and of the great commissure of the brain, in certain bird-like characters of the heart†, and from all other diphyodont Mammals in a less number of premolars, and a greater number of true molars,—depending essentially on the retention of a milk-tooth (*m. 4*), which is displaced and changed in the placental diphyodonts,—that the true affinities of the didelphid and ornithodelphid mammals to each other, and their true position in the class *Mammalia*, were finally recognized.

In the 'Systema Vertebratorum,' communicated in 1840 to the Linnean Society by that accomplished and indefatigable zoologist Prince Charles Lucien Bonaparte, the primary subdivision of the Mammalia according to developmental and generative characters is adopted; and the first division or series *Placentalia* is subdivided, agreeably with M. Jourdan's distribution of Mammalia in the Leyden Museum, into the two subclasses *Educabilia* and *Ineducabilia*, the latter including the orders *Bruta*, *Cheiroptera*, *Insectivora* and *Rodentia*, with the common character of 'cerebrum unilobum.' This I regard as the most important improvement in the classification of the Mammalia, which has been proposed since the establishment of the natural character of the implacental or ovo-viviparous division.

Cuvier had early noticed the relation of the Australian mammals, as a small collateral series, to the unguiculate mammals of

* Ossements Fossiles, 4to. ed. 1812, p. 9; tom. iii. ed. 1822, p. 72.

† On the Classification of the *Marsupialia*, Zoological Transactions, vol. ii. p. 315 (1839).

the rest of the world, "some," he writes, "corresponding with the *Carnaria*, some with the *Rodentia*, and others again with the *Edentata**."

M. Isidore Geoffroy St. Hilaire, in his 'Classification parallèle des Mammifères,' published in 1845, raises the *Marsupialia* to the rank of a distinct class, and literally exemplifies the idea of Cuvier by placing its subdivisions, as orders, in parallel equivalents with the orders of the *Placentalia*.

It does not appear, however, that Cuvier meant to do more than indicate certain relations of analogy; just as the relation of the pedimanous and frugivorous Marsupials to the pedimanous *Quadrumana* of S. America, that of the marsupial *Hyæna* (*Thylacinus*) to the Wolf, of the Flying Petaurist to the Flying Squirrel, of the Wombat to the Beaver, of the Kangaroo to the Ruminant, of the Koala to the phytiphagous Sunbear, of the Opossums to the Shrews, and of the Echidna to the Anteater, &c., had been pointed out by myself. My esteemed friend and colleague Mr. Waterhouse, whilst admitting the justness of some of these comparisons, appended a timely warning, in a valuable note in his comprehensive and excellent history of the *Marsupialia*†, against the mistake to which the young zoologist might be liable, of concluding the analogical groups of the *Marsupialia* and *Placentalia* thus indicated to be of equal rank and value. I have always participated in this conviction of the lower value of the *Implacentalia* as compared with the *Placentalia*; and have used those terms merely as useful collective or general signs of certain modifications of structure, which are associated with the development and non-development of the placenta.

In like manner, when indicating the highest generalization to which I had arrived after comparisons of the dentition of the Mammalia, by the terms 'monophyodont' and 'diphyodont‡,' signifying respectively the single and double set of teeth developed in different groups of the class, I have been careful to guard myself from being misunderstood, as supposing that the monophyo-

* Règne Animal, ed. 1829, vol. i. p. 174.

† Natural History of the Mammalia, 8vo. 1845, part i. p. 14. I must remark, however, that in stating "by Prof. Owen and some other naturalists, the present section (*Marsupiata*) is ranked as a subclass," the reader, from the peculiarly extended signification given to the term 'Marsupiata,' might be misled. The *Marsupialia* form one of the orders of my subclass *Implacentalia*. See the articles 'Marsupialia' and 'Monotremata,' in the "Cyclopædia of Anatomy," vol. iii. 1841.

‡ Cyclopædia of Anatomy, part xxxvii. 1849. Phil. Trans. 1850, p. 493.

dont *Monotremata*, *Bruta*, and *Cetacea*, formed an equivalent group with the diphyodont bulk of the Mammalia, or that the binary groups, defined by this single dental character, were natural ones.

Nothing more than a passing allusion seems needed to the system of classifying the Mammalia on the modifications of the placenta, originally proposed by Sir Everard Home*, and since reproduced and modified by a few other naturalists. The group, *e.g.* associated by the character of the discoid placenta, is as little natural as that which would be composed on the basis of the diphyodont dentition, or the unguiculate feet. The association of the *Rodentia* and *Insectivora* with the *Quadrumanæ*, as in the latest modification of the placentary system†, is not likely to command acceptance. The diffused placenta, as in the Mare, Porpoise, Peccari, Rhinoceros, and Camel, would lead to an equally heterogeneous assemblage. In two well-defined minor groups, *e.g.* the true *Carnivora* and the true *Ruminantia*, there exist characteristic modifications of the placenta, viz. the zonular and cotyledonal respectively; but though the zonular type is common to the *Carnivora*, it is not peculiar to them; it is that of the placenta in the Hyrax and the Elephant, amongst the *Ungulata*. So likewise the cotyledonal type characterizes the placenta of the Sloth among the *Bruta*.

Primary Divisions of the Mammalia.—The question or problem of the truly natural and equivalent primary groups of the class *Mammalia* has occupied much of my consideration, and has ever been present to my mind when gathering any new facts in the anatomy of the Mammalia, during dissections of the rarer forms which have died at the Zoological Gardens, or on other opportunities.

The peculiar value of the leading modifications of the mammalian brain, in regard to their association with concurrent modifications in other important systems of organs, was illustrated in detail in the Hunterian Course of Lectures on the Comparative Anatomy of the Nervous System, delivered by me at the Royal College of Surgeons in 1842. The ideas which were broached or suggested, during the delivery of that course, I have tested by every subsequent acquisition of anatomical knowledge, and now feel myself justified in submitting to the judgement of the Linnean Society, with a view to publication, the following fourfold primary division of the mammalian class, based upon the four leading modifications of cerebral structure in that class.

* Lectures on Comparative Anatomy, vol. iii. 4to. p. 445.

† GERVAIS, Zoologie et Paléontologie Française, 4to. 1853, p. 194.

The brain is that part of the organization which, by its superior development, distinguishes the Mammalia from all the inferior classes of VERTEBRATA; and it is that organ which I now propose to show to be the one that by its modifications marks the best and most natural primary divisions of the class.

In some mammals the cerebral hemispheres are but feebly and partially connected together by the 'fornix' and 'anterior commissure:' in the rest of the class a part called 'corpus callosum' is added, which completes the connecting or 'commissural' apparatus.

With the absence of this great superadded commissure* is associated a remarkable modification of the mode of development of the offspring, which involves many other modifications; amongst which are the presence of the bones called 'marsupial,' and the non-development of the deciduous body concerned in the nourishment of the progeny before birth, called 'placenta;' the young in all this 'implacental' division being brought forth prematurely, as compared with the rest of the class.

This first and lowest primary group, or subclass, of Mammalia may be termed, from its cerebral character, *LYENCEPHALA*†,—signifying the comparatively loose or disconnected state of the cerebral hemispheres. The size of these hemispheres (fig. 1, A) is such that they leave exposed the olfactory ganglions (a), the cerebellum (c), and more or less of the optic lobes (B); their surface is generally smooth; the anfractuositities, when present, are few and simple.

The next well-marked stage in the development of the brain is where the corpus callosum (indicated in fig. 2, by the dotted lines d, d) is present, but connects cerebral hemispheres as little advanced in bulk or outward character as in the preceding subclass; the cerebrum (A) leaving both the olfactory lobes (a) and cerebellum (c) exposed, and being commonly smooth, or with few and simple convolutions in a very small proportion, composed of the largest members of the group. The mammals so characterized constitute the subclass *LISSENCEPHALA*‡ (fig. 2).

In this subclass the testes are either permanently or temporarily concealed in the abdomen: there is a common external genito-urinary aperture in most; two precaval veins ('superior' or 'anterior venæ cavæ') terminate in the right auricle. The squamosal in most, and the tympanic in many, retain their primitive separation as distinct bones. The orbits have not an entire rim

* "On the Structure of the Brain in Marsupial Animals," Philos. Trans. 1837, p. 87.

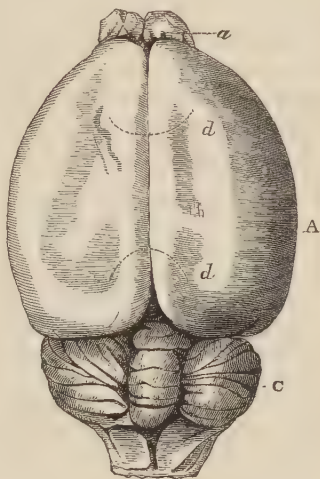
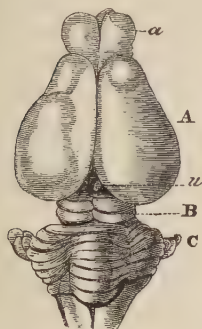
† λύω, to loose; ἐγκέφαλος, brain.

‡ λισσός, smooth; ἐγκέφαλος, brain.

of bone. Besides these more general characters by which the *Lissencephala*, in common with the *Lyencephala*, resemble Birds and Reptiles, there are many other remarkable indications of their affinity to the Oviparous Vertebrata in particular orders or genera

Fig. 2.—Brain of Beaver.

Fig. 1.—Brain of Opossum.



of the subclass. Such, *e.g.*, are the cloaca, convoluted trachea, supernumerary cervical vertebræ and their floating ribs, in the 3-toed Sloth; the irritability of the muscular fibre, and persistence of contractile power in the Sloths and some other Bruta; the long, slender, beak-like edentulous jaws and gizzard of the Anteaters; the imbricated scales of the equally edentulous Pangolins, which have both gizzard and gastric glands like the proventricular ones in birds; the dermal bony armour of the Armadillos like that of loricated Saurians; the quills of the Porcupine and Hedgehog; the proventriculus of the Dormouse and Beaver; the prevalence of disproportionate development of the hind-limbs in the *Rodentia*; coupled, in the Jerboa, with confluence of the three chief metatarsals into one bone, as in birds; the keeled sternum and wings of the Bats; the aptitude of the *Cheiroptera*, *Insectivora*, and certain *Rodentia* to fall, like Reptiles, into a state of true torpidity, associated with a corresponding faculty of the heart to circulate carbonized or black blood:—these, and the like indications of co-affinity with the *Lyencephala* to the Oviparous air-breathing Vertebrata, have mainly prevailed with me against an acquiescence

in the elevation of different groups of the Lissencephala to a higher place in the Mammalian series, and in their respective association, through some single character, with better-brained orders, according to Mammalogical systems which, at different times, have been proposed by zoologists of deserved reputation. Such, *e.g.*, as the association of the long-clawed *Bruta* with the *Ungulata**, and of the shorter-clawed Shrews, Moles and Hedgehogs, as well as the Bats, with the *Carnivora*†; of the Sloths with the *Quadrumana*‡; of the Bats with the same high order§; and of the *Insectivora* and *Rodentia* in immediate sequence after the Linnean ‘Primates,’ as in the latest published ‘System of Mammalogy,’ from a distinguished French author||.

* Macleay, Linn. Trans. vol. xvi. (1833); Gray, Dr. J. E., Mammalia in the British Museum, 12mo. 1843, p. xii.

† Cuvier, Règne Animal, 1829, p. 110.

‡ De Blainville, Ostéographie, 4to. fasc. 1. p. 47 (1839).

§ Linnæus, Systema Naturæ.

|| Prof. Gervais, Zoologie et Paléontologie Française, 4to. 1852, p. 194. This scheme is avowedly an adoption of that proposed by Professor Milne-Edwards, in the first volume of the 3rd series of the ‘Annales des Sciences Naturelles,’ 1844, in a paper entitled ‘Considérations sur quelques Principes relatifs à la Classification Naturelle des Animaux,’ &c.; in referring to which, M. Gervais states his conviction that Milne-Edwards, “a mis hors de doute les rapports des Rongeurs avec les premiers Mammifères.”—Annales des Sciences Naturelles, ser. iii. vol. i. p. 251. The high and justly-earned reputation of both these naturalists renders it incumbent on me to state the doubts with respect to the actual affinity of the *Rodentia* to the *Quadrumana* which remained on my mind after an attentive perusal of the arguments urged by Milne-Edwards. The first of these arguments is based upon an alleged resemblance of placental structure, expressed by the term “à placenta discoïde,” applied as a character to the *Bimana*, *Quadrumana*, *Cheiroptera*, *Insectivora* and *Rodentia*, collectively.

The degree of resemblance in outward form, between the placenta of the Rat or Hare, on the one hand, and the *Myeetes* and *Macacus* on the other, seems to me to be more than counterbalanced by the difference of structure. The pedunculate and cotyloid placenta of the Rat consists of foetal parts exclusively; the maternal areolar portion is as distinct from it as it is in the cotyledon of the Ruminant, and is a persistent structure of the uterus. The discoid placenta of the Monkey includes a large proportion of maternal cellular structure, which comes away with the foetal portion. The difference in the organic interblending of the circulatory organs of mother and offspring, between the *Rodentia* and *Quadrumana*, is of much more real importance than the degree of superficial similarity. Still more significant, in regard to genetic grounds of affinity, is the great difference in the development and function of the vitellicle or umbilical sac in the foetal membranes of the two orders. But, as regards outward form, the cotyloid placenta of the *Muridæ* differs more from the thin, expanded and subdivided placenta of the Hare, than it does from that of the Marmoset Monkey: then, it signifies something in the argument drawn from similarity

The third leading modification of the Mammalian cerebrum is such an increase in its relative size, that it extends over more or

of form, that there are two distinct discoid placenta in *Callithrix* as in *Cercopithecus*, *Macacus* and *Semnopithecus*; whilst in *Myctes*, as in *Troglodytes*, there is but one such placenta.

The structure of the discoid placenta in the *Pteropus*, like that of the Rat, more resembles that of the fetal portion of the cotyledon in the Cow than that of the cellulo-vascular spongy placenta of the *Quadrumana*; and this difference, with the more important one of the larger umbilical sac, appears to me to greatly outweigh the degree of resemblance in mere outward form of the placenta. Any argument in favour of the affinity of the *Cheiroptera* to the *Quadrumana*, based on that degree of resemblance, must be affected by the prevalence of the double discoid placenta in the *Quadrumana*. Since Hunter first made known that modification* in a species of *Macacus*, which, from a comparison of the fetus now preserved in the Museum of the Royal College of Surgeons, I believe to be the 'Wrinkled Baboon' of Shaw (*Macacus rhesus*, Desm.), Professor Breschet has described and figured the two separate discoid placenta in the small South American Squirrel-monkey (*Callithrix sciureus*, Kuhl), in the Green Monkey (*Cercopithecus sabæus*, Desm.), and in the Long-nosed Monkey (*Semnopithecus nasicus*). Yet this well-marked modification of the cellulo-vascular placenta is not constant in the *Quadrumana*, or even in the primary groups of the order. In the *Platyrrhines*, e.g., the Howler (*Myctes seniculus*, Kuhl) has a single placenta, and amongst the *Catarrhines*, I have ascertained that, in the Chimpanzee (*Troglodytes niger*) the placenta is single, as in the Human subject.

The five flat placental lobes, virtually as distinct as if they were separate placenta, in the Hare, resemble more the subdivided placenta of the Sloth than the single hemispheroid pedunculate placenta of the Rat, or the flattened circular placenta of the Howler Monkey. In short, the observed differences of form in the placenta of the *Rodentia*, *Insectivora*, *Cheiroptera* and *Quadrumana* by no means justify the use of one general term as applicable to the whole†.

The second argument for the association of the *Insectivora*, *Cheiroptera* and *Rodentia* with the *Quadrumana* is taken from alleged conformity of cerebral structure.

"Le cerveau d'un Rongeur diffère à peine de celui d'un Insectivore; il existe aussi une ressemblance extrême entre l'encephale d'un Insectivore et celui de certains Quadrumanes;" whence it is meant to be inferred, that there is the same extreme resemblance between the brain in *Rodentia* and certain *Quadrumana*. In my paper on the 'Brains of the Marsupialia' (Phil. Trans. 1837), I have described and figured (pl. v. p. 93) the brain of a Beaver (see fig. 2, p. 15) and that of a small Monkey (*Midas rufimanus*, fig. 3, p. 19), showing the absence of cerebral convolutions in both. As the cerebral hemispheres have since been shown to be equally smooth in other *Hapalidæ* of Isidore Geoffroy, in the Potto Lemur‡ (*Perodicticus*, Bennett), in *Microcebus*§, and with few and feeble traces of con-

* Animal Economy, 4to. 1780.

† Annales des Sciences Nat. tom. cit. p. 96.

‡ Bijdrage tot de Kennis van den Potto van Bosman, 4to. 1851, V. der Hoeven.

§ Comptes Rendus de l'Acad. des Sciences, Janvier 19, 1852.

less of the cerebellum ; and generally more or less over the olfactory lobes. Save in very few exceptional cases of the smaller and inferior forms of *Quadrumana* (fig. 3), the superficies is folded into more or less numerous gyri or convolutions,—whence the name *GYRENCEPHALA**, which I propose for the third subclass of Mammalia (fig. 4).

In this subclass we shall look in vain for those marks of affinity to the *Ovipara*, which have been instanced in the preceding subclasses. The testes are, indeed, concealed, and through an obvious

volutions in *Stenops tardigradus* (Vrolik, Rech. d'Anatomie comparée sur le genre *Stenops*, in N. Verhand. der 1ste Klasse Koninkl. Nederl. Inst. Amsterdam, Oct. 1843) ; there is, to that extent, in the *Quadrumanous* order, a superficial resemblance to the non-convoluted brains of the *Rodentia* and *Insectivora* ; but it is attended by that more important difference in the form and proportions of the cerebral hemispheres, of which I express my estimate by the system of Classification proposed in the present paper.

The smooth hemispheres of the brain of the *Midas* (fig. 3, A) “extend, as in most of the *Quadrumana*, over the greater part of the cerebellum (c)” (Phil. Trans. 1837, p. 93) ; it resembles, in short, the brain of the Human embryo before the cerebral surface begins to be folded ; whereas in the *Insectivora*, in the Beaver, and even in the Capybara, in which there are a few shallow anfractuosités, the cerebral hemispheres leave the cerebellum quite exposed.

With regard to the alleged contrast between the brains of the *Rodentia* and *Carnivora*, in the breadth of the anterior and middle part of the cerebral hemispheres, a comparison of the brains of the Beaver and Coatimondi, and of the Porcupine and the Civet Cat, leaves me entirely unable to appreciate the force of the remark.

The third argument for the high position of the *Rodentia*, *Cheiroptera* and *Insectivora* in the Mammalian scale, is deduced from some particulars of their osteology, and principally from the common presence of the clavicle in them, as contrasted with its constant absence in the *Carnivora* and *Ungulata*. The clavicle is present in all *Quadrumana*, but it is not a peculiar characteristic of the higher forms of the Mammalian class. It is much more constant in the class of Birds and Reptiles : it is present in the *Monotremes*, in *Marsupials*, and in most *Bruta*. An affinity of the *Insectivora* and of the clavicate *Rodentia* with a lower vertebrate type, might therefore be inferred from the clavicle, at least with as much reason, as with the Apes and Man. As to the shape of the articular cavity for the mandible, the *Rodentia* differ more from the *Quadrumana* in this particular than the *Carnivora* do ; whilst, in respect of the size, form, and persistent individuality of the tympanic bone, the *Rodentia* plainly show their more essential relations to the oviparous type ; the *Carnivora* resembling the *Quadrumana* in the early coalescence of the petrotympanic with the squamosal elements of the temporal bone.

Such are some of the considerations which have induced me to set a different value than M. Gervais does, on the arguments adduced by Prof. Milne-Edwards in favour of an association of the *Rodentia* with the *Quadrumana*, in a highly placed primary group of the Mammalian class.

* γυρῶ, to bend or wind ; ἐγκέφαλος, brain.

adaptive principle, in the Cetacea; but, in the rest of the sub-class, with the exception of the Elephants, they pass out of the abdomen, and the Gyrencephalous quadrupeds, as a general rule, have a scrotum. The vulva is externally distinct from the anus. With

Fig. 4.—Chimpanzee.



the exception, again, of the Elephants, the blood from the head and anterior limbs is returned to the right auricle by a single precaval trunk. The mammalian modification of the Vertebrate type attains its highest physical perfections in the *Gyrencephala*, as manifested by the bulk of some, by the destructive mastery of others, by the address and agility of a third order. And, through the superior psychological faculties—an adaptive intelligence predominating over blind instinct—which are associated with the higher development of the brain, the *Gyrencephala* afford those species which have ever formed the most cherished companions and servitors, and the most valuable sources of wealth and power, to Mankind.

In Man the brain presents an ascensive step in development, higher and more strongly marked than that by which the preceding subclass was distinguished from the one below it. Not only do the cerebral hemispheres (figs. 5 & 6, A) overlap the olfactory lobes and cerebellum, but they extend in advance of the one, and further back than the other (fig. 6, c). Their posterior development is so marked, that anatomists have assigned to that part the character of a third lobe; it is peculiar to the genus *Homo*, and

equally peculiar is the 'posterior horn of the lateral ventricle,' and the 'hippocampus minor,' which characterize the hind lobe of each hemisphere. The superficial grey matter of the cerebrum, through the number and depth of the convolutions, attains its maximum of extent in Man.

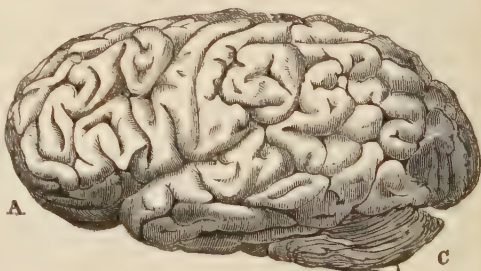
Peculiar mental powers are associated with this highest form of brain, and their consequences wonderfully illustrate the value of the cerebral character; according to my estimate of which, I am led to regard the genus *Homo*, as not merely a representative of a distinct order, but of a distinct subclass of the Mammalia*, for which I propose the name of '*ARCHENCEPHALA* †' A (fig. 6).

With this preliminary definition of the organic characters, which appear to

Fig. 5.—Negro.



Fig. 6.—Side view, Negro.



* Not being able to appreciate, or conceive of the distinction between the psychical phænomena of a Chimpanzee and of a Boschisman, or of an Aztec with arrested brain-growth, as being of a nature so essential as to preclude a comparison between them, or as being other than a difference of degree, I cannot shut my eyes to the significance of that all-pervading similitude of structure—every tooth, every bone, strictly homologous,—which makes the determination of the difference between *Homo* and *Pithecus* the anatomist's difficulty. And, therefore, with every respect for the Author of the "Records of Creation" (8vo, 1816, pp. 18–21), I follow Linnæus and Cuvier in regarding mankind as a legitimate subject of zoological comparison and classification.

† ἄρχω, to overrule; ἐγκέφαλος, brain.

guide to a conception of the most natural primary groups of the class *Mammalia*, I next proceed to define the groups of secondary importance, or the subdivisions of the foregoing subclasses.

In the *Lyencephalous Mammalia* some have the 'optic lobes' simple, others partly subdivided, or complicated by accessory ganglions, whence they are called 'bigeminal bodies.' The *Lyencephala* with simple optic lobes are 'edentulous' or without calcified teeth, are devoid of external ears, scrotum, nipples, and marsupial pouch: they are true 'testiconda;' they have a coracoid bone extending from the scapula to the sternum, and also an epicoracoid and episternum, as in Lizards; they are ungiculate and pentadactyle, with a supplementary tarsal bone supporting a perforated spur in the male. The order so characterized is called '*MONOTREMATA*,' in reference to the single excretory and generative outlet, which, however, is by no means peculiar to them among *Mammalia*. The *Monotremes* are insectivorous, and are strictly limited to Australia and Tasmania.

The *MARSUPIALIA* are Mammals distinguished by a peculiar pouch or duplicature of the abdominal integument, which in the males is everted, forming a pendulous bag containing the testes; and in the females is inverted, forming a hidden pouch containing the nipples and usually sheltering the young for a certain period after their birth: they have the marsupial bones in common with the *Monotremes*; a much-varied dentition, especially as regards the number of incisors, but usually including 4 true molars; and never more than 3 premolars*: the angle of the lower jaw is more or less inverted†.

With the exception of one genus, *Didelphys*, which is American, and another genus *Cuscus*, which is Malayan, all the known existing Marsupials belong to Australia, Tasmania, and New Guinea. The grazing and browsing Kangaroos are rarely seen abroad in full daylight, save in dark rainy weather. Most of the Marsupialia are nocturnal. Zoological wanderers in Australia, viewing its plains and scanning its scrubs by broad daylight, are struck by the seeming absence of mammalian life; but during the brief twilight and dawn, or by the light of the moon, numerous forms are seen to

* "Outlines of a Classification of the Marsupialia," Trans. Zool. Soc. vol. ii. 1839.

† For other Osteological and Dental characteristics of the Marsupialia, see the paper above cited, and that "On the Osteology of the Marsupialia," Trans. Zool. Soc. vol. ii. p. 379 (1838).

emerge from their hiding-places and illustrate the variety of marsupial life with which many parts of the continent abound. We may associate with their low position in the mammalian scale the prevalent habit amongst the Marsupialia of limiting the exercise of the faculties of active life to the period when they are shielded by the obscurity of night.

The Lissencephala or smooth-brained Placentals form a group which I consider as equivalent to the Lyencephala or Implacentals; and which includes the following orders, *Rodentia*, *Insectivora*, *Cheiroptera* and *Bruta*. The RODENTIA are characterized by two large and long curved incisors in each jaw, separated by a wide interval from the molars; and these teeth are so constructed, and the jaw is so articulated, as to serve in the reduction of the food to small particles by acts of rapid and continued gnawing, whence the name of the order. The orbits are not separated from the temporal fossæ. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with prostatic and vesicular glands. The placenta is commonly discoid, but is sometimes a circular mass (Cavy), or flattened and divided into three or more lobes (Lepus). The Beaver and Capybara are now the giants of the order, which chiefly consists of small, numerous, prolific and diversified unguiculate genera, subsisting wholly or in part on vegetable food. Some Rodents, *e. g.* the Lemmings, perform remarkable migrations, the impulse to which, unchecked by dangers or any surmountable obstacles, seems to be mechanical. Many Rodents build very artificial nests, and a few manifest their constructive instinct in association. In all these inferior psychical manifestations we are reminded of Birds. Many Rodents hibernate like Reptiles. They are distributed over all continents.

The transition from the Marsupials to the Rodents is made by the Wombats; and the transition from the Marsupials is made, by an equally easy step, through the smaller Opossums to the INSECTIVORA. This term is given to the order of small smooth-brained Mammals, the molar teeth of which are bristled with cusps, and are associated with canines and incisors: they are unguiculate, plantigrade, and pentadactyle, and they have complete clavicles. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with large prostatic and vesicular glands: like most other *Lissencephala*, the Insectivora have a discoid or cup-shaped placenta. Their place and office in South America and Australia are fulfilled by Marsupialia; but true Insectivora exist in all the other continents.

The order CHEIROPTERA, with the exception of the modification of their digits for supporting the large webs that serve as wings, repeat the chief characters of the Insectivora; but a few of the larger species are frugivorous and have corresponding modifications of the teeth and stomach. The mammae are pectoral in position, and the penis is pendulous in all Cheiroptera. The most remarkable examples of periodically torpid Mammals are to be found in the terrestrial and volant Insectivora. The frugivorous Bats differ much in dentition from the true Cheiroptera, and would seem to conduct through the Colugos or Flying Lemurs, directly to the Quadrumanous order. The Cheiroptera are cosmopolitan.

The order BRUTA, called *Edentata* by Cuvier, includes two genera which are devoid of teeth; the rest possess those organs, which, however, have no true enamel, are never displaced by a second series, and are very rarely implanted in the premaxillary bones. All the species have very long and strong claws. The ischium as well as the ilium unites with the sacrum; the orbit is not divided from the temporal fossa. I have already adverted to the illustration of affinity to the oviparous Vertebrata which the Three-toed Sloths afford by the supernumerary cervical vertebræ supporting false ribs and by the convolution of the windpipe in the thorax; and I may add that the unusual number—three and twenty pairs—of ribs, forming a very long dorsal, with a short lumbar, region of the spine in the Two-toed Sloth, recalls a laceratine structure. The same tendency to an inferior type is shown by the abdominal testes, the single cloacal outlet, the low cerebral development, the absence of medullary canals in the long bones in the Sloths, and by the great tenacity of life and long-enduring irritability of the muscular fibre, in both the Sloths and Ant-eaters*.

The order Bruta is but scantily represented at the present period. One genus, *Manis* or Pangolin, is common to Asia and Africa; the *Orycteropus* is peculiar to South Africa; the rest of

* This latter vital character attracted the notice of the earliest observers of these animals. Thus Marcgrave and Piso narrate of the Sloth:—"Cor motum suum validissimè retinebat, postquam exemptum erat e corpore per semihorium:—exempto corde cæteris visceribus, multò post se movebat et pedes lentè contrahebat sicut dormituriens solet." Buffon, who quotes the above from the '*Historia Naturalis Brasiliæ*,' p. 322, well remarks, "Par ces rapports, ce quadrupède se rapproche non seulement de la tortue, dont il a la lenteur, mais encore des autres reptiles et de tous ceux qui n'ont pas un centre du sentiment unique et bien distinct."—*Hist. Naturelle*, 4to, tom. xiii. p. 45.

the order, consisting of the genera *Myrmecophaga*, or true Ant-eaters, *Dasyus* or Armadillos, and *Bradypus* or Sloths, are confined to South America.

Having defined the orders or subdivisions of the two foregoing subclasses, I may remark that the Lyencephala cannot be regarded as equivalent merely to one of the orders, say *Rodentia*, of the Lissencephala, without undervaluing the anatomical characters which are so remarkable and distinct in the marsupial and monotrematous animals. The anatomical peculiarities of the edentulous Lyencephala* appear to me to be, at least, of ordinal importance. In these deductions I hold the mean between those who, with Geoffroy St. Hilaire, would make of the *Monotremata* a distinct class of animals, or with De Blainville, a distinct subclass (*Ornithodelphes*) of Mammals†, and those who, with Cuvier, would make the Monotremes a mere family of the *Edentata*, or, with Mr. Waterhouse, a family of the *Marsupiatæ*‡. In like manner, whilst I regard the Lyencephala (*Marsupiatæ* of Waterhouse) as forming a group of higher rank than an order, I do not consider it as forming an equivalent primary group to that formed by all the placental Mammalia.

It appears to me that the true value of the Lyencephala or Implacentalia is that of one of four primary divisions or subclasses of the Mammalia; that its true equivalency is with the Lissencephala, and that all its analogical relations are to be found more truly in that smooth-brained subclass than in the Placentalia at large.

The following Table exemplifies the correspondence of the groups in the Lyencephalous and Lissencephalous series:—

| LYENCEPHALA. | LISSENCEPHALA. |
|---|--|
| <i>Rhizophaga</i> § | Burrowing <i>Rodentia</i> . |
| <i>Poëphaga</i> § | <i>Dipodidæ</i> and <i>Leporidæ</i> . |
| <i>Petaurus</i> | <i>Pteromys</i> . |
| <i>Phalangistidæ</i> | <i>Sciuridæ</i> and prehensile-tailed arboreal Rodents. |
| <i>Phascolarctos</i> | <i>Bradypus</i> . |
| <i>Perameles</i> and <i>Myrmecobius</i> | <i>Erinaceidæ</i> . |
| <i>Chæropus</i> | <i>Macroscelis</i> . |

* See my article *Monotremata*, in the Cyclopædia of Anatomy, part xxvi. 1841.

† Ostéographie, fascicule premier, 4to, 1839, p. 47.

‡ Nat. Hist. of Mammalia, part i. 1845, p. 18.

§ See the 'Classification of the Marsupialia,' in the Zoological Transactions, vol. ii. p. 232.

LYENCEPHALA.

LISSENCEPHALA.

| | |
|---|------------------------------------|
| <i>Didelphys</i> and <i>Phascogale</i> .. | <i>Soricidæ</i> . |
| <i>Dasyuridæ</i> | <i>Centetes</i> , <i>Gymnura</i> . |
| <i>Echidna</i> | <i>Manis</i> . |
| <i>Ornithorhynchus</i> | <i>Orycteropus</i> . |

The classification proposed by M. Gervais, already cited (p. 16), in which the *Rodentia*, *Cheiroptera*, and *Insectivora* are associated in the same high primary group with the *Quadrumanæ* and *Bimana*, is avowedly adopted from that previously proposed by Prof. Milne-Edwards*.

In next proceeding to consider the subdivisions of the Gyrencephala, we seem at first to descend in the scale in meeting with a group of animals in that subclass, having the form of Fishes; but a high grade of mammalian organization is masked beneath this form. The Gyrencephala are primarily subdivided, according to modifications of the locomotive organs, into three series, for which the Linnean terms may well be retained; viz. *Mutilata*, *Ungulata* and *Unguiculata*, the maimed, the hoofed, and the clawed series.

These characters can only be applied to the Gyrencephalous subclass; *i. e.* they do not indicate natural groups, save in that section of the Mammalia. To associate the Lyencephala and Lissancephala with the unguiculate Gyrencephala into one great primary group, as in the Mammalian systems of Ray, Linnæus and Cuvier, is a misapplication of a solitary character akin to that which would have founded a primary division on the discoid placenta or the diphyodont dentition. No one has proposed to associate the unguiculate Bird or Lizard with the unguiculate Ape; and it is but a little less violation of natural affinities to associate the Monotremes with the Quadrumanes in the same primary (unguiculate) division of the Mammalian class.

The three primary divisions of the Gyrencephala are of higher value than the ordinal divisions of the Lissancephala; just as those orders are of higher value than the representative families of the Marsupials.

The *Mutilata*, or the maimed Mammals with folded brains, are so called because their hind-limbs seem, as it were, to have been amputated; they possess only the pectoral pair of limbs, and these in the form of fins: the hind end of the trunk expands into a broad, horizontally flattened, caudal fin. They have large brains with many and deep convolutions, are naked, and have neither neck, scrotum, nor external ears.

* See note at p. 16.

The first order, called CETACEA, in this division are either edentulous or monophyodont, and with teeth of one kind and usually of simple form. They are testiconda and have no 'vesiculæ seminales.' The mammæ are pudendal; the placenta is diffused; the external nostrils—single or double—are on the top of the head, and called spiracles or "blow-holes." They are marine, and, for the most part, range the unfathomable ocean; though with certain geographical limits as respects species. They feed on fishes or marine animals.

The second order, called SIRENIA, have teeth of different kinds, incisors which are preceded by milk-teeth, and molars with flattened or ridged crowns, adapted for vegetable food. The nostrils are two, situated at the upper part of the snout; the lips are beset with stiff bristles; the mammæ are pectoral; the testes are abdominal, as in the Cetacea, but are associated with vesiculæ seminales. The Sirenia exist near coasts or ascend large rivers; browsing on fuci, water plants or the grass of the shore. There is much in the organization of this order that indicates its affinity to members of the succeeding division.

In the *Ungulata* the four limbs are present, but that portion of the toe which touches the ground is incased in a hoof, which blunts its sensibility and deprives the foot of prehensile power. With the limbs restricted to support and locomotion, the Ungulata have no clavicles: the fore-leg remains constantly in the state of pronation, and they feed on vegetables.

A particular order, or suborder, of this group is indicated by certain South American genera, *e. g.* *Toxodon* and *Nesodon**, with long, curved, rootless teeth, having a partial investment of enamel, and with certain peculiarities of cranial structure: the name TOXODONTIA is proposed for this order, all the representatives of which are extinct.

A second remarkable order, most of the members of which have, also, passed away, is characterized by two incisors in the form of long tusks; in one genus (*Dinotherium*) projecting from the under jaw, in another genus (*Elephas*) from the upper jaw, and in some of the species of a third genus (*Mastodon*), from both jaws. There are no canines; the molars are few, large and transversely ridged; the ridges sometimes few and mammillate, often numerous and with every intermediate gradation. The nose is prolonged into a cylindrical trunk, flexible in all directions, highly sensitive, and terminated by a prehensile appendage like a finger: on this organ

* Philosophical Transactions, 1853, p. 291.

is founded the name *PROBOSCIDIA* given to the order. The feet are pentadactyle, but are indicated only by divisions of the hoof; the testes are abdominal; the placenta is annular*; the mammæ are pectoral.

Both the present and preceding orders of *Ungulata* may be called aberrant: the dentition of the *Toxodon*, and several particulars of the organization of the Elephant, indicate an affinity to the *Rodentia*; the cranium of the *Toxodon*, like that of the *Dinothere*, resembles that of the *Sirenia* in its remarkable modifications.

The typical Ungulate quadrupeds are divided, according to the odd or even number of the toes, into *PERISSODACTYLA* and *ARTIODACTYLA*†. In the perissodactyle or odd-toed *Ungulata*—odd-toed at least in regard to the hind-foot,—the dorso-lumbar vertebræ differ in number in different species, but are never fewer than twenty-two; the femur has a third trochanter; and the medullary artery does not penetrate the fore-part of its shaft. The fore-part of the astragalus is divided into two very unequal facets. The os magnum and the digitus medius which it supports are large, in some disproportionately so, and the digit is symmetrical: the same applies to the ectocuneiform and the digit which it supports in the hind-foot. If the species be horned, the horn is single; or, if there be two, they are placed on the median line of the head, one behind the other, each being thus an odd horn. The nasals expand posteriorly. There is a well-developed post-tympanic process which is separated by the true mastoid from the paroccipital in the Horse, but unites with the lower part of the paroccipital in the Tapir, and seems to take the place of the mastoid in the Rhinoceros and Hyrax. The hinder half, or a larger proportion of the palatines enters into the formation of the posterior nares, the oblique aperture of which commences in advance either of the last molar, or, as in most, of the penultimate one. The pterygoid process has a broad and thick base, and is perforated lengthwise by the ectocarotid. The crown of from one to three of the hinder premolars is as complex as those of the molars‡: that of the last lower milk-molar is commonly bilobed. To these osteological and dental characters may be added some important modifications of internal structure, as, *e.g.* the simple form of the stomach and the capacious and sacculated

* Besides the annular placenta there is a subcircular villous patch at each pole of the chorionic bag, by which it derived additional attachment to the uterus, in the Elephant.

† From *περισσοδάκτυλος*, qui digitos habet impares numero; and *ἄρτιος*, par, *δάκτυλος*, digitus.

‡ The extinct *Lophiodonts* form the sole known exception to this rule.

cæcum, which equally evince the mutual affinities of the odd-toed or perissodactyle hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is replaced by a diffused vascular villosity of the chorion in all the recent genera of this order, excepting the little *Hyrax*, in which there is a localised annular placenta, as in the Elephant. But the diffused placenta occurs in some genera of the next group, showing the inapplicability of that character to exact classification. Many extinct genera, *e. g.* *Coryphodon*, *Pliolophus*, *Lophiodon*, *Tapirotherium*, *Palæotherium*, *Ancitherium*, *Hipparion*, *Acerotherium*, *Elasmotherium*, &c., have been discovered, which once linked together the now broken series of Perissodactyles, represented by the existing genera *Rhinoceros*, *Hyrax*, *Tapirus*, and *Equus*.

In the even-toed or 'artiodactyle' Ungulates, the dorso-lumbar vertebræ are the same in number, as a general rule, in all the species, being nineteen. The recognition of this important character appears to have been impeded by the variable number of moveable ribs in different species of the Artiodactyles, the dorsal vertebræ, which those ribs characterize, being fifteen in the Hippopotamus and twelve in the Camel. And the value of this distinction has been exaggerated owing to the common conception of the ribs as special bones distinct from the vertebræ, and their non-recognition as parts of a vertebra equivalent to the neurapophyses and other autogenous elements. The vertebral formulæ of the Artiodactyle skeletons show that the difference in the number of the so-called dorsal and lumbar vertebræ does not affect the number of the entire dorso-lumbar series: thus, the Indian Wild Boar has *d.* 13, *l.* 6=19; the Domestic Hog and the Peccari have *d.* 14, *l.* 5=19; the Hippopotamus has *d.* 15, *l.* 4=19; the Gnu and Aurochs have *d.* 14, *l.* 5=19; the Ox and most of the true Ruminants have *d.* 13, *l.* 6=19; the aberrant Ruminants have *d.* 12, *l.* 7=19. The natural character and true affinities of the Artiodactyle group are further illustrated by the absence of the third trochanter in the femur, and by the place of perforation of the medullary artery at the fore and upper part of the shaft, as in the Hippopotamus, the Hog, and most of the Ruminants. The fore part of the astragalus is divided into two equal or sub-equal facets: the os magnum does not exceed, or is less than, the unciforme in size, in the carpus; and the ectocuneiform is less, or not larger, than the cuboid, in the tarsus. The digit answering to the third in the pentadactyle foot is unsymmetrical, and forms, with that answering to the fourth, a symmetrical

pair. If the species be horned, the horns form one pair or two pairs; they are never developed singly, of symmetrical form, from the median line. The post-tympanic does not project downward distinctly from the mastoid, nor supersede it in any Artiodactyle; and the paroccipital always exceeds both those processes in length. The bony palate extends further back than in the Perissodactyles; the hinder aperture of the nasal passages is more vertical and commences posterior to the last molar tooth. The base of the pterygoid process is not perforated by the ectocarotid artery. The crowns of the premolars are smaller and less complex than those of the true molars, usually representing half of such crown. The last milk-molar is trilobed.

To these osteological and dental characters may be added some important modifications of internal structure, as, *e. g.* the complex form of the stomach in the Hippopotamus, Peccari, and Ruminants; the comparatively small and simple cæcum and the spirally folded colon in all Artiodactyles, which equally indicate the mutual affinities of the even-toed hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is dif-fused in the Camel-tribe and non-ruminants; is cotyledonal in the true Ruminants. Many extinct genera, *e. g.* *Chæropotamus*, *Anthracotherium*, *Hyopotamus*, *Entelodon*, *Dichodon*, *Merycopotamus*, *Xiphodon*, *Dichobune*, *Anoplotherium*, *Microtherium*, &c., have been discovered, which once linked together the now broken series of Artiodactyles, represented by the existing genera, *Hippopotamus*, *Sus*, *Dicotyles*, *Camelus*, *Auchenia*, *Moschus*, *Camelopardalis*, *Cervus*, *Antilope*, *Ovis*, and *Bos*.

A well-marked, and at the present day very extensive subordinate group of the Artiodactyles, is called *Ruminantia*, in reference to the second mastication to which the food is subject after having been swallowed; the act of rumination requiring a peculiarly complicated form of stomach. The Ruminants have the 'cloven foot,' *i. e.* two hoofed digits on each foot forming a symmetrical pair, as by the cleavage of a single hoof; in most species two small supplementary hoofed toes are added. The metacarpals of the two functional toes coalesce to form a single 'cannon-bone,' as do the corresponding metatarsals. The Camel-tribe have the upper incisors reduced to a single pair; in the rest of the Ruminants the upper incisors are replaced by a callous pad. The lower canines are contiguous, and, save in the Camel-tribe, similar to the six lower incisors, forming part of the same terminal series of eight teeth, between which and the molar series there is a wide

interval. The true molars have their grinding surface marked by two double crescents, the convexity of which is turned inwards in the upper and outwards in the under jaw.

Many fossil Artiodactyles, with similar molars, appear to have differed from the Ruminants chiefly by retaining structures which are transitory and embryonic in most existing Ruminants, as, *e. g.* upper incisors and canines*, first premolars, and separate metacarpal and metatarsal bones; these are among the lost links that once connected more intimately the Ruminants with the Hog and Hippopotamus.

The Pachyderms in the Cuvierian system included all the non-ruminant hoofed beasts; they were divided by the great French anatomist into the *Proboscidea*, *Solidungula*, and *Pachydermata ordinaria*, the latter again being subdivided according to the odd or even number of the hoofs. I have on another occasion† adduced evidence to show that the right progression of the affinities of the *Ungulata* was broken by the interposition of the Horse and other Perissodactyles between the non-ruminant or omnivorous and ruminant Artiodactyles; and that too high a value had been assigned to the Ruminantia by making them equivalent to all the other Ungulates collectively‡.

* In a new-born Dromedary (*Camelus Dromedarius*, L.), which perished in the birth at the London Zoological Gardens, the following was the state of the dentition. In the upper jaw there were six deciduous incisors (3—3), which were calcified, and presented a larger proportional size than any rudiments of those teeth that have been noticed in ordinary Ruminants, and they leave conspicuous alveoli in the premaxillaries: the deciduous canine and first functional milk-molar (*d.* 2) were small, the latter with a simple crown; the second (*d.* 3) and third (*d.* 4) molars were large, bilobed, and each lobe was bierescentic. In the lower jaw the six incisors and two canines form a semicircular series of nearly equal teeth, with overlapping leaf-shaped crowns, the deciduous canines more resembling the incisors than the permanent ones do: the functional molars are but two in number, on each side; the first is small, simple, conical, compressed, notched behind; the second is very large and three-lobed, each lobe being bierescentic, and the last the largest. Only the summits of the crescents of the molar teeth had pierced the gum (Catal. of Osteology, Mus. Roy. Coll. of Surgeons, vol. ii. p. 577, 4to, 1853).

† Quarterly Journal of the Geological Society, December 1847.

‡ Since the communication of my paper on the classification and affinities of the hoofed animals to the Geological Society, Nov. 3, 1847, in which the grounds for the division of the *Ungulata* into two orders, according to the parity or imparity of the digits, as proposed in my 'Odontography,' are given in detail, the idea has been ventilated and more or less adopted by M. Pomel (Comptes Rendus de l'Acad. des Sciences, June 19, 1848), and by M. Gervais (Zoologie et Paléontologie Française, p. 42). The latter experienced palæontologist, extending the term 'Pachydermes' to include all the Ungulates, divides

The third division of the *Gyrencephala* enjoy a higher degree of the sense of touch through the greater number and mobility of the digits, and the smaller extent to which they are covered by horny matter. This substance forms a single plate, in the shape of a claw or nail, which is applied to only one of the surfaces of the extremity of the digit, leaving the other, usually the lower, surface possessed of its tactile faculty; whence the name *Unguiculata*, applied to this group, which, however, is more restricted and natural than the group to which Linnæus extended the term. All the species are 'diphyodont,' and the teeth have a simple investment of enamel.

The first order, CARNIVORA, includes the beasts of prey, properly so called. With the exception of a few Seals, the incisors are $\frac{3-3}{3-3}$ in number; the canines $\frac{1-1}{1-1}$, always longer than the other teeth, and usually exhibiting a full and perfect development as lethal weapons; the molars graduate from a trenchant to a tuberculate form, in proportion as the diet deviates from one strictly of flesh to one of a more miscellaneous kind. The clavicle is rudimental or absent; the innermost digit is often rudimental or absent; they have no vesiculæ seminales; the teats are abdominal; the placenta is zonular. The Carnivora are divided, according to modifications of the limbs, into 'pinnigrades,' 'plantigrades,' and 'digitigrades.' In the Pinnigrades (Walrus, Seal-tribe) both fore and hind feet are short, and expanded into broad, webbed paddles for swimming, the hinder ones being fettered by continuation of integument to the tail. In the Plantigrades (Bear-tribe) the whole or nearly the whole of the hind foot forms a sole, and rests on the ground. In the Digitigrades (Cat-tribe, Dog-tribe, &c.) only the toes touch the ground, the heel being much raised.

It has been usual to place the Plantigrades at the head of the Carnivora, apparently because the higher order, Quadrumana, is plantigrade; but the affinities of the Bear, as evidenced by internal structure, *e. g.* the renal and genital organs, are closer to the Seal-tribe*; the broader and flatter pentadactyle foot of the plantigrades into 'Pachydermes herbivores' and 'Pachydermes omnivores,' respectively equivalent to my *Perissodactyla* and *Artiodactyla*, which latter terms M. Pomel adopts. M. Gervais writes: "Les pachydermes omnivores se lient d'une manière si intime aux Ruminants par les Chevrotains et les Chameaux, qu'il est devenu impossible de séparer, comme ordre différent de celui des Ruminants l'ensemble de ces Pachydermes, autrefois confondus avec les Pachydermes herbivores."—*Op. cit.* Expl. de Planche xxxvi. p. 6, 4to, 1854.

* 'Catalogue of the Physiological Series,' Mus. R. Coll. of Surgeons, 4to, vol. ii. 1834, p. 127. Mr. Waterhouse, in noticing the projecting process on the

grade is nearer in form to the flipper of the Seal than is the more perfect digitigrade, retractile-clawed, long and narrow hind foot of the feline quadruped, which is the highest and most typical of the Carnivora.

The next perfection which is superinduced upon the unguiculate limb is such a modification in the size, shape, position, and direction of the innermost digit, that it can be opposed, as a thumb, to the other digits, thus constituting what is properly termed a 'hand.' Those Unguiculates which have both fore and hind limbs so modified, or at least the hind limbs, form the order QUADRUMANA. They have $\frac{2-2}{2-2}$ incisors*, and $\frac{3-3}{3-3}$ broad tuberculate molars†; perfect clavicles, pectoral mammæ, vesicular and prostatic glands, a simple or slightly bifid uterus, and a discoid, sometimes double, placenta‡. The Quadrumana have a well-marked threefold geographical as well as structural division. The Strepsirhines are those with curved or twisted terminal nostrils, with much modified incisors, commonly $\frac{3-3}{3-3}$; premolars $\frac{3-3}{3-3}$ or $\frac{2-2}{2-2}$ in number, and molars with sharp tubercles; the second digit of the hind limb has a claw. This group includes the Galagos, Pottos, Aye-Ayes, Loris, Indris, and the true Lemurs; the three latter being restricted to Madagascar, whence the group diverges in one direction to the continent of Africa, in the other to the Indian Archipelago. The Platyrrhines are those with the nostrils subterminal and wide apart; premolars $\frac{3-3}{3-3}$ in number, the molars with blunt tubercles; the thumbs of the fore-hands not opposable or wanting; the tail in most prehensile; they are peculiar to South America. The Catarhines have the nostrils oblique and approximated below, and opening above and behind the muzzle: the premolars are $\frac{2-2}{2-2}$ in number; the thumb of the fore-hand is opposable. They are restricted to the Old World, and, save a single species on the rock of Gibraltar, to Africa and Asia. The highest organized family of Catarhines is tailless, and offers in the Orang and Chimpanzee the nearest approach to the human type.

under side of the ramus, a little in advance of the angle of the lower jaw in the *Ursidæ*, remarks:—"The same character is also found in many Seals (*Phocidæ*), which in several other respects appear to approach the bears."—Proc. Zool. Soc. Sept. 1839.

* With few exceptions in the anomalous *Lemuridæ*.

† Reduced to $\frac{2-2}{2-2}$ in the Marmosets (*Hapale*, *Mydas*).

‡ Among the Platyrrhines, the placenta is single in *Myctes*, double in *Callithrix*: among the Catarhines, the placenta is double in *Macacus*, *Cercopithecus*, and *Semnopithecus*, single in *Troglodytes*.

The structural modifications in the genus *Homo*,—the sole representative of the *Archencephala*,—more especially of the lower limb, by which the erect stature and bipedal gait are maintained, are such as to claim for MAN ordinal distinction on merely external zoological characters. But as I have already argued, his psychological powers, in association with his extraordinarily developed brain, entitle the group which he represents to equivalent rank with the other primary divisions of the class *Mammalia* founded on cerebral characters. In this primary group Man forms but one genus, *Homo*, and that genus but one order, called BIMANA, on account of the opposable thumb being restricted to the upper pair of limbs. The testes are scrotal; their serous sac does not communicate with the abdomen; they are associated with vesicular and prostatic glands. The penis is pendulous, and the prepuce has a frænum. The mammæ are pectoral. The placenta is a single, subcircular, cellulo-vascular, discoid body.

Man has only a partial covering of hair, which is not merely protective of the head, but is ornamental and distinctive of sex. The dentition of the genus *Homo* is reduced to thirty-two teeth by the suppression of the outer incisor and the first two premolars of the typical series on each side of both jaws, the dental formula being:—

$$i. \frac{2-2}{2-2}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{2-2}{2-2}, \quad m. \frac{3-3}{3-3} = 32.$$

All the teeth are of equal length, and there is no break in the series; they are subservient in Man not only to alimentation, but to beauty and to speech.

The human foot is broad, plantigrade, with the sole, not inverted as in *Quadrumanæ*, but applied flat to the ground; the leg bears vertically on the foot; the heel is expanded beneath; the toes are short, but with the innermost longer and much larger than the rest, forming a 'hallux' or great toe, which is placed on the same line with, and cannot be opposed to, the other toes; the pelvis is short, broad, and wide, keeping well apart the thighs; and the neck of the femur is long, and forms an open angle with the shaft, increasing the basis of support for the trunk. The whole vertebral column, with its slight alternate curves, and the well-poised, short, but capacious subglobular skull, are in like harmony with the requirements of the erect position. The widely-separated shoulders, with broad scapulæ and complete clavicles, give a favourable position to the upper limbs, now liberated from the service of locomotion, with complex joints for rotatory as well as

flexile movements, and terminated by a hand of matchless perfection of structure, the fit instrument for executing the behests of a rational intelligence and a free will. Hereby, though naked, Man can clothe himself, and rival all native vestments in warmth and beauty; though defenceless, Man can arm himself with every variety of weapon, and become the most terribly destructive of animals. Thus he fulfils his destiny as the supreme master of this earth, and of the lower Creation.

In these endeavours to comprehend how Nature has associated together her mammalian forms, the weary student quits his task with a conviction that, after all, he has been rewarded with but an imperfect view of such natural association. The mammalian class has existed, probably from the triassic, certainly from the lower oolitic period; and has changed its generic and specific forms more than once in the long lapse of ages, during which life-work has been transacted on this planet by animals of that high grade of organization. Not any of the mammalian genera of the secondary periods occur in the tertiary ones. No genus found in the older eocenes (plastic and septarial clays, &c.) has been discovered in the newer eocenes. Extremely few eocene genera occur in miocene strata, and none in the pliocene. Many miocene genera of Mammalia are peculiar to that division of the tertiary series. Species indistinguishable from existing ones begin to appear only in the newer pliocene beds. Whilst some groups, as *e.g.* the Perissodactyles and omnivorous Artiodactyles, have been gradually dying out, other groups, as *e.g.* the true Ruminants, have been augmenting in genera and species.

In many existing genera of different orders there is a more specialized structure, a greater deviation from the general type, than in the answering genera of the miocene and eocene periods; such later and less typical Mammalia do more effective work by their more adaptively modified structures. The Ruminants, *e.g.* more effectually digest and assimilate grass, and form out of it a more nutritive and sapid kind of meat, than did the antecedent more typical or less specialized non-ruminant Herbivora.

The monodactyle Horse is a better and swifter beast of draught and burthen than its tridactyle predecessor the miocene *Hippa-rion* could have been. The nearer to a Tapir or a Rhinoceros in structure, the further will an equine animal be left from the goal in contending with a modern Racer. The genera *Felis* and *Ma-chairodus*, with their curtailed and otherwise modified dentition and

short strong jaws, become, thereby, more powerfully and effectively destructive than the eocene *Hyænodon* with its typical dentition and three carnassial teeth on each side of its concomitantly prolonged jaws could have been.

Much additional and much truer insight has, doubtless, been gained into the natural grouping of the Mammalia since palæontology has expanded our survey of the class; but our best-characterized groups do but reflect certain mental conceptions, which must necessarily relate to incomplete knowledge, and that as acquired at a given period of time. Thus the order which Cuvier deemed the most natural one in the class *Mammalia* becomes the debris of a group, known at a subsequent period to be a more natural order.

We cannot avoid recognizing, in the scheme which I now submit, the inequality which reigns amongst the groups, which our present anatomical knowledge leads us to place in one line or parallel series as orders. I do not mean mere inequality as respects the number and variety of the families, genera, and species of such orders, because the paucity or multitude of instances manifesting a given modification or grade of structure in no essential degree affects the value of such grade or modification.

The order *Monotremata* is not the less ordinally distinct from the *Marsupialia*, because it consists of but two genera, than is the order *Bimana* from that of *Quadrumana*, because it includes only a single genus. So likewise the anatomical peculiarities of the *Proboscidea*, *Sirenia*, and *Toxodontia* call, at least, for those general terms, to admit of the convenient expression of general propositions respecting them; and some of these general propositions are of a value as great as the organic characters of more expanded orders.

There are residuary or aberrant forms in some of the orders, which, to the systematist disagreeably, compel modifications of the characters that would apply to the majority of such orders. The flying Lemurs (*Galeopithecii*), the rodent Lemurs (*Cheiromys*), the slow Lemurs (*Loris*, *Otolienus*), forbid any generalization as to teeth or nails in the *Quadrumana*, whilst they continue associated with that order by the character of the hinder thumb; which, by the way, they possess in common with the pedimanous Marsupials. The large, volant, frugivorous Bats (*Pteropus*) are equally opposed to the application of a common dental character to the *Cheiroptera*. They are associated with the insectivorous Bats on account of the common external form arising out of the modification of their locomotive

organs for flight, just as the Dugongs and Manatees are associated with the *Cetacea* on account of their resemblance to Fishes arising out of the same modification of the locomotive system for an aquatic existence. The herbivorous *Cetacea* are now separated from the piscivorous *Cetacea* as a distinct order; and with almost as good reason we might separate the frugivorous from the insectivorous *Cheiroptera*; the cases are very nearly parallel.

Nature, in short, is not so rigid a systematist as Man. There are peculiar conditions of existence which she is pleased shall be enjoyed by peculiarly modified mammals; these peculiarities break through the rules of structure which govern the majority of species existing and subsisting under the more general conditions of existence, to which the larger groups of Mammalia are respectively adjusted.

One class of organs seems to govern one order, another class another order; the dental system, which is so diversified in the *Marsupialia* and *Bruta*, is as remarkable for its degree of constancy in the *Rodentia* and *Insectivora*. But, as a general rule, the characters from the dental, locomotive, and placental systems are more closely correlated in the Gyrencephalous orders than in those in the inferior subclasses of the Mammalia.

In the subjoined tabular view of the classification of the Mammalia, the groups below the ranks of orders are inserted merely as illustrations of those orders, not as equivalent subdivisions, or as the most natural subdivisions of those orders, into which it has not been the aim of the present paper to enter.

TABLE of the Subclasses and Orders of the Mammalia.

CLASS.

SUBCLASS.

ORDER.

Archencephala*

BIMANA

Homo.

QUADRUMANA.....

Catarrhina.

Unguiculata

Platyrrhina.

CARNIVORA.....

Strepsirrhina.

AETIODACTYLA

Digitigrada.

PERISSODACTYLA ...

Plantigrada.

PROBOSCIDA

Pinnigrada.

TOXODONTIA

Omnivora.

SIRENTIA

Ruminantia.

CETACEA

Solungula.

BRUTA.....

Mulgula.

CHEIROPTERA.....

Elephas.

INSECTIVORA

Dinotherium.

RODENTIA

Toadon.

MARSUPIATA

Nesodon.

MONOTREMATA

Manatus.

BRUTA.....

Halicore.

CHEIROPTERA.....

Delphinide.

INSECTIVORA

Balaenide.

RODENTIA

Bradyptide.

MARSUPIATA

Dasyptide.

MONOTREMATA

Edentula.

BRUTA.....

Erugivora.

CHEIROPTERA.....

Insectivora.

INSECTIVORA

Talpide.

RODENTIA

Erinaceide.

MARSUPIATA

Soricide.

MONOTREMATA

Non-claviculata.

BRUTA.....

Claviculata.

CHEIROPTERA.....

Rhizophaga.

INSECTIVORA

Poëphaga.

RODENTIA

Carpophaga.

MARSUPIATA

Entomophaga.

MONOTREMATA

Echidna.

BRUTA.....

Ornithorhynchus.

MAMMALIA

Gyrencephala†

Unguicula.....

Mutilata

Lisencephala‡

Lyencephala§

Description of a new form of Naked-Eyed Medusa (*Thaumantias achroa*), with brief histological details. By T. SPENCER COBBOLD, Esq., M.D. Communicated by the Secretary.

[Read March 17, 1857.]

(Abstract.)

THIS specimen was obtained from the shore of the Firth of Forth, and presented the following characters:—The form and general aspect of the *umbrella* resembles that of the more typical species, being hemispherical, transparent, colourless, smooth, slightly elongated vertically when in a state of rest, the transverse diameter measuring rather more than the third of an inch and becoming much increased during contraction, the length of the disk at the same time being proportionately lessened. The circumferential portion of the umbrella is fringed by 24 tentacula of extreme delicacy and unusual length; also by eight ocelli, a circular gastro-vascular canal, and a well-defined shelf-like veil directed inwards. The *tentacula*, while relaxed and motionless, are fully three times the length of the disk, their particular number and arrangement ($5 \times 4 + 4$) also constituting a satisfactory mark of identification. Amplified fifty diameters, they exhibit a finely granular and ringed appearance, analogous to that of the prehensile labiate organs of *Hydroïda*; even with an ordinary pocket-lens indications of knotting may be seen at the extremities of the cirrhi. To the naked eye the tentacular bulbs appear colourless and homogeneous, but under a magnification of 300 diameters linear, the sub-epidermic tissues display numerous closely packed oval or fusiform cells, which refract light very strongly. Near the extremity of the thread, the cells are more cogently developed, and being placed at a right angle to the axis of the filament, appear to stand out from the investing epidermis. At the upper part the tentacula exhibit lateral lines in their interior, denoting the presence of a central canal, the markings becoming more conspicuous near the bulb. Within the bulb the limiting membrane of an otolithic vesicle was discernible, but there were apparently no vibratory movements within the cavity. The *ocelli*, eight in number (2×4), are placed round the circular margin of the disk, at intervals between every third tentacle—an arrangement somewhat peculiar. Each ocellus consists of a transparent vesicle containing a round nucleus, and in addition five bright yellow, highly refracting globules, the central and superior one being the largest. The *sub-umbrella* is placed

rather higher than midway between the marginal ring and the convex surface of the disk. The depth of the concavity lessened during contraction, but not uniformly so, it being observed that the upper part remained unaffected to the extent of a third of its area, from the summit downwards, forming, as it were, a *point d'appui* for the development of contractile action throughout the remainder of the membrane. The proboscidiiform *peduncle* has all the features common to the genus. The *gastro-vascular* canals—four radiating and one circumferential—contain two kinds of corpuscles; the smaller are rather less in diameter than human-blood globules, while the larger, apparently mother-cells, are nearly three times greater, possessing nuclei of variable size, but frequently identical in character with the lesser corpuscles. They moved in a moderately rapid and regular manner, their course in the radiating vessels being continuous from one half of the hemisphere to the other. Thus, two vessels carried the particles from the marginal canal, convergingly, to the central point of intercommunication, on the one hand, and two conveyed the same elements from the centre, divergingly, on the other. The *reproductive glands*, four in number, elongated or semiclavate, are placed on the inferior surface of the sub-umbrella, a short way distant from the margin, and in the course of the radiating canals. Each gland was subdivided by one of the radiating vessels traversing its long axis. The subjacent ova at the surface generally displayed an outer cell-wall, with its included transparent albumen, a second membrane surrounding the molecular yolk, and a third constituting the germinal spot, within which were three or four rounded particles, beautifully distinct. Deeper in the organ were similar cells, smaller in size and imperfectly developed, evidently destined to supply the place of those ripe for expulsion.

To facilitate identification, it may be remarked that *Thaumantias inconspicua* has the disk wider and more flattened, purplish-coloured glands and twenty tentacles. *T. punctata* has thirty-two tentacula, and is a larger species, with the umbrella more depressed, and *T. Thomsoni* has but sixteen tentacula. There is no other British species for which *Thaumantias achroa* can be readily mistaken.

On the Irregularity in the Return of Swallows and other vernal migratory Birds, this Season, 1857. By Dr. THOMAS FORSTER, F.L.S. &c.

[Read June 2, 1857.]

As the following facts will probably be interesting to the Linnean Society, I have carefully extracted them from my Journal of Natural History.

The order of arrival of the Swallow tribe has been quite reversed. The Chimney Swallow, *Hirundo rustica*, who usually arrives in Belgium about the 15th of April, made his first appearance early in May, and then only a straggler or two. This species is not yet common, and after a most careful search after Swallows, up to May the 11th, I had not *myself* seen a single specimen: one or two are said to have been observed about the waters of Ixelles.

A straggling Martin, *H. urbica*, was observed by me on the 23rd of April; but I did not see another till the 9th of May, and this species is still very scarce. Today (14th of May) a *few* Swallows may also be seen. In general, both species are by this time very numerous.

The Swift, *H. apus*, who usually arrives in Belgium before the 1st of May, did not appear till the 9th; and yesterday these birds are become common, though much less numerous than last year.

The Sand Martin, *H. riparia*, has not yet arrived.

The Cuckoo has been heard only once or twice, and that in the first week of May.

I find by consulting ancient records that the occasional delay of the arrival of the Swallow was noticed in Greece of old, and it is probably to some occasion of this kind that we may attribute the line in some poet, I believe Aristophanes,

Ἦ Ζεῦ, χελιδὼν ἄρα πότε φαινέσεται;!!!

The absence of west winds on the continent has been no less remarkable, as this wind has always been connected with the return of the Swallow—

“Cum Zephyris, si concedes, et hirundine primâ.”

So says Horace; and the Martin has also been said to come with S.W. breezes. Ovid represents this wind as blowing

“Quum luteum celsâ sub trabe fingit opus.”

The scarcity of all the vernal songsters has likewise been remarked: the season is altogether late and anomalous.

Bruxelles, May 14th, 1857.

Note on a singular case of Colouring of the Human Hair. By
WILLIAM A. GUY, M.B. Extracted from a Letter addressed
to the President.

[Read April 7th, 1857.]

A turner of the name of Ford, employed by the Government to turn several thousands of round rulers for the army in the Crimea, presented himself in the laboratory of King's College one day, in great distress. He was called upon to attend a funeral, and was scandalized at his somewhat ridiculous appearance in consequence of the curious green tint of his hair. Our people in the laboratory washed his head with all the common reagents which occurred to them, but without effect. Being informed of this curious fact, and being interested in it as having some sort of bearing on the question of identification, I called on Mr. Ford, and found him in the state described. His hair, which is naturally a light chestnut, was changed, except towards the roots, of a bright yellow-green, with a very decided and curious green tint. His children, whose hair is of a similar tint, were similarly affected. He told me that his hair and that of his family had always been affected in the same way when engaged in turning rulers from the wood known as *green ebony*—a wood, as he says, generally used for that purpose. His wife's hair, which is black, is not subject to any change. The exposed parts of the skin undergo the same change of colour, as does the urine. He also told me that one of his children was born with a very remarkably deep-green tinted skin, which disappeared in time. As one of our porters passes Broad Street, I send you a specimen I have had put up, showing a bit of the wood, a tube-full of turnings, and three specimens of hair—the two on the left showing the natural colour of the hair of Mr. Ford and one of his children, the specimens on the right the same hair discoloured by the wood, and a single specimen from his own head, showing the usual colour at the root, and the green tint towards the points. The appearance of the whole head, and the contrast of the roots with the rest of the hair, are much more striking than the specimen itself might lead you to expect.

King's College, London,
January 27th, 1857.

Catalogue of the Hymenopterous Insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. WALLACE. By FREDERICK SMITH, Assistant in the Zoological Department in the British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., F.L.S.

[Read June 16th, 1857.]

Fam. ANDRENIDÆ, *Leach*.

Gen. HALICTUS, *Latr.*

1. HALICTUS CERATINUS. *H. niger*; alis hyalinis; abdomine clavato.

Male. Length $3\frac{1}{2}$ lines. Black: the head closely and finely punctured; antennæ as long as the thorax, the flagellum obscurely testaceous beneath; the face covered with griseous pubescence; the mandibles ferruginous at their apex. Thorax closely punctured; the wings hyaline and iridescent, their apex slightly clouded; the nervures and tegulæ testaceous; the legs rufo-testaceous, the tarsi paler, and covered with pale glittering pubescence. Abdomen clavate; the apical margins of the segments with fasciæ of short white pubescence, frequently more or less obliterated; shining and delicately punctured; beneath, the apex of the third segment, and the fourth, entirely clothed with very short whitish pubescence; the abdomen is of a dark rufo-testaceous hue, palest beneath, varying in different individuals.

Hab. Borneo (Sarawak).

This remarkable form of *Halictus* occurs at Sierra Leone. I have described a species from that locality, the "*H. clavatus*;" it is a smaller and very distinct species from *H. ceratinus*; in this species the first recurrent nervure is received in the middle of the second submarginal cell.

2. HALICTUS VAGANS. *H. ater*, cinereo-pubescent; abdomine nitido, segmentis intermediis basi fascia albis.

Female. Length $4\frac{1}{2}$ lines. Black: the clypeus produced, the face covered with cinereous pubescence. Thorax closely punctured above; the mesothorax thinly covered with short erect pale pubescence; the post-scutellum with a dense short downy pubescence; the metathorax truncated, and having some irregular coarse striæ at the base above; the wings hyaline and iridescent, the nervures and tegulæ testaceous; the legs with a short yellowish-white downy pubescence. Abdomen delicately punctured, the basal margin of the second and two following segments with a fascia of short yellowish-white pubescence, the apical segment covered with similar pubescence.

This species bears a very striking resemblance to the *Halictus leucozonius* of Europe.

Hab. Borneo (Sarawak).

3. *HALICTUS BASALIS*. *H. niger*; alis hyalinis; abdomine clavato, basi ferrugineo.

Male. Length 3 lines. Black: the antennæ nearly as long as the thorax, the flagellum fulvous beneath; the face covered with a dense griseous pubescence; the mandibles rufo-piceous. Thorax thinly clothed with pale pubescence; the wings hyaline and iridescent, the nervures pale testaceous; the tibiæ and tarsi pale rufo-testaceous, the latter palest. Abdomen clavate, shining and finely punctured; the first segment and the apical margin of the second, ferruginous; the second and following segments with fasciæ of pale pubescence.

Hab. Singapore.

This conspicuous insect might be mistaken at first sight for a variety of "*H. ceratinus*," but in that species the apical margin of the fifth segment of the abdomen, beneath, is straight, or very slightly emarginate at the sides; in the present species it is *deeply emarginate its entire width*.

Gen. *NOMIA*, *Latr.*

1. *NOMIA APICALIS*. *N. nigra*, punctata; abdomine nitido, scutello bituberculato; alis apice nigris.

Male. Length 5 lines. Black: the head with scattered cinereous pubescence, dense and short on the sides of the face; the clypeus with a longitudinal impression; somewhat swollen on each side; the flagellum testaceous beneath. Thorax closely punctured, subopaque; a line of pale pubescence beneath the scutellum, which is bituberculate; the tegulæ yellowish; the wings hyaline, the nervures testaceous, the costal nervure dark brown; the apex of the anterior wings with a large dark fuscous cloud; the legs with a glittering cinereous pubescence; the posterior tibiæ curved, and dilated at their apex. Abdomen shining and punctured, the apical margins of the segments depressed, the apical half of the depressions impunctate.

Hab. Singapore.

2. *NOMIA IRIDESCENS*, *Westw. MS.* *N. nigra*; capite thoraceque punctatis subopacis; faciei pube grisea; pedibus nigris; abdomine fasciis tribus cæruleis; alis hyalinis.

Female. Length 4 lines. Black: very closely and finely punctured; the head and thorax with a griseous pubescence, most dense on the face and sides of the metathorax; the clypeus with a central longitudinal carina; the mandibles obscurely ferruginous at the apex; a white line on the posterior margin of the prothorax, which passes on to and surrounds the tubercles; the scutellum bordered with a line of very short white pubescence; the tegulæ pale testaceous; the wings fulvo-hyaline, with the nervures pale ferruginous; the legs clothed with a mixture of dark brown and griseous pubescence, that on the posterior tibiæ within, and on all the tarsi beneath, fulvous; the claw-

joint of the tarsi ferruginous. Abdomen shining, with an obscure violet tinge in certain lights; the apical margins of the second, third and fourth segments with a fascia of bright green or blue-green; beneath, thickly and coarsely punctured.

Hab. Malacca, India.

3. *NOMIA ELEGANS*. *N. nigra*; capite thoraceque punctatis subopacis; alis hyalinis; pedibus subferrugineis; abdomine fasciis cæruleo-iridibus pulchriter ornatus.

Female. Length 5 lines. Black: the head closely and finely punctured, the clypeus coarsely so, with a central longitudinal depression, subtuberculate on each side; the labrum and mandibles ferruginous, the latter black at their tips; the scape in front, and the apical joints of the flagellum beneath, yellowish. Thorax: shining, with very delicate shallow punctures; a transverse band of pale pubescence at the apical margin of the scutellum; the base of the metathorax with a deep depression which is crossed by a series of short striæ; the sides of the metathorax with a dense pale fulvous pubescence; the legs pale rufo-testaceous, and covered with short glittering pale pubescence; wings subhyaline and iridescent; the nervures testaceous, the costal nervure and the stigma dark fuscous; the apex of the anterior wings slightly clouded. Abdomen smooth and shining, the apical margins of the segments with narrow, vivid blue-green fasciæ.

Hab. Malacca.

Most closely resembling the "*Nomia crassipes* ♀," but that insect has the abdomen punctured, and the fasciæ broad, particularly at the apex of the abdomen.

Subfam. ANDRENOIDES.

Gen. CTENOPECTRA, *Smith*.

Head transverse: *antennæ* inserted in the middle of the face, short, not reaching to the middle of the thorax; the basal joint of the flagellum not narrowed at the base; the second joint of the same length as the first, much narrowed at the base; the three following joints transverse and of equal length, the five apical ones rather longer, of equal length, the apex of the apical joint pointed; the *labrum* transverse, the anterior margin rounded; the *mentum* rather longer than the labium, the former acute at its apex, the latter blunt or rounded; the *labial palpi* 4-jointed, the two basal joints stout and of equal length, the two apical ones shorter and much more slender; the *paraglossæ* about the same length as the palpi; the *maxillary palpi* 6-jointed, the three basal joints stout and of equal length, the three apical joints much more slender, and each in succession shorter than the preceding; the *ocelli* placed in a curve on the vertex. *Thorax*: large and ovate; the *anterior wings* with one marginal and two sub-

marginal cells, the second receiving both the recurrent nervures; *legs* with the femora broad and compressed; the calcaria at the apex of the intermediate tibiæ stout, acute, and bent at the apex, its hinder margin toothed like a fine comb; the inner spine of the posterior calcaria toothed in a similar manner, the teeth much longer, those at the base of the spine longest, decreasing in length to the apex; the posterior tibiæ and basal joint of the tarsi densely covered with long hair; the claws of the tarsi bifid. *Abdomen* subovate, truncated at the base.

This is a very remarkable genus of Bees: it appears to be most nearly allied to the genus *Macropis*; the neuration of the anterior wings is very similar, and the labial and maxillary palpi consist of the same number of joints; the ocelli are placed in a curve, and the posterior legs have a dense clothing or pollen-brush as in that genus.

The beautiful comb with which the posterior tibiæ are furnished is doubtless for the purpose of removing the grains of pollen collected on the hairs which clothe the shanks. (Plate I. details.)

1. CTENOPLECTRA CHALYBEA. *C. capite thoraceque nigris, abdomineque chalybeo, pedibus posterioribus dense pilosis.*

Female. Length 6 lines. Head and thorax black: the head closely punctured; the clypeus shining, the punctures more scattered, and with a slight carina in the middle of its base; the scape in front, and the flagellum beneath, rufo-piceous; the mandibles ferruginous at their apex. Thorax opaque-black: the metathorax smooth and shining in the middle of its base, the sides covered with sooty-black pubescence; wings fuscous, palest at their apical margins; the posterior tibiæ and basal joint of the tarsi densely covered with long black pubescence, the inner pectinated calcar pale testaceous-yellow. Abdomen: steel-blue above, black beneath.

Hab. Malacca (Mount Ophir).

Subfam. DASYGASTRÆ.

Gen. MEGACHILE, *Latr.*

1. *Megachile atrata*, *Smith, Cat. Hym.* pt. 1. p. 182.

Hab. Borneo (Sarawak); Philippine Islands.

2. *Megachile ornata*, *Smith, Cat. Hym.* 1. p. 183.

Hab. Borneo (Sarawak); India.

3. *Megachile umbripennis*, *Smith, Cat. Hym.* pt. 1. p. 175.

Hab. Borneo (Sarawak) and Nepaul.

4. MEGACHILE AMPUTATA. *M. nigra*; capite thoraceque pube fulva vestitis; abdominis segmentis apicalibus fulvo marginatis; pedibus rufis.

Female. Length 7 lines. Black: the head and thorax clothed above with fulvous pubescence, on the cheeks and thorax beneath it is

slightly griseous; the clypeus shining and punctured, with a longitudinal carina in the middle, thinly covered with pubescence; the flagellum fulvous beneath. Thorax: the tegulæ and legs ferruginous; the wings fusco-hyaline, the nervures fusco-ferruginous, brightest towards the base of the wings. Abdomen: the two basal segments clothed with fulvous pubescence, the four apical segments with black; all the segments with a fascia of short fulvous pubescence on their apical margins; beneath, the three basal segments thinly clothed with pale fulvous pubescence, the three apical ones with black.

Allied to, but very distinct from, the *Anthophora rufipes* of Fabricius.

Hab. Borneo (Sarawak).

5. *MEGACHILE TUBERCULATA*. *M. nigra*; capite thoraceque punctatis, mandibulis fortibus et porrectis; clypeo tuberculato; alis fulvo-hyalinis; abdomine totius nigro.

Female. Length 10 lines. Black: clothed with black pubescence on the vertex and disk of the thorax, on the abdomen above it is sparing; the clypeus produced in the middle, forming a large prominent tubercle; the mandibles long, very stout and prominent, with a stout bluntish tooth on their inner margin near their base, and having three large teeth at their apex, the apical one acute. The outer margin of the tegulæ ferruginous; the wings fulvo-hyaline, the nervures ferruginous, their apical margins with a fuscous border. Abdomen: the basal segment densely clothed with sooty-black pubescence; beneath, densely clothed with black pubescence.

Hab. Borneo (Sarawak).

6. *MEGACHILE ARCHITECTA*. *M. nigra*, nitida et punctata; abdomine pube læte fulva subtus vestito; alis subhyalinis apice nebulosis.

Female. Length 6 lines. Black, shining and punctured: the face, cheeks and thorax beneath, thinly clothed with griseous pubescence, the sides of the metathorax densely so; the wings subhyaline, with a fuscous cloud at the apex of the superior pair; the posterior femora and tibiæ with a short fine cinereous pubescence, that on all the tarsi beneath, fulvous. Abdomen subovate and curving upwards, each segment with a deeply impressed transverse line; beneath, densely clothed with long bright fulvous pubescence.

Hab. Borneo (Sarawak).

7. *MEGACHILE LUCTUOSA*. *M. nigra opaca*; alis hyalinis; abdomine subtus fulvo; apice pube grisea vestito.

Female. Length 6 lines. Opake-black: very closely punctured; the wings hyaline and iridescent, the nervures black; the base of the metathorax with fuscous pubescence, the sides as well as the thorax beneath with griseous; the apical margins of the second, third and fourth segments with narrow fasciæ of whitish pubescence, the two former widely interrupted; the fifth and sixth densely covered

with short, whitish pubescence; beneath, clothed with fulvous pubescence.

Hab. Singapore.

8. *MEGACHILE ROTUNDICEPS*. *M. nigra* opaca; alis fulvo-hyalinis, nervuris ferrugineis; abdomine subtus fulgido-argentato vestito.

Female. Length 6 lines. Opaque-black: very closely and rather finely punctured; the labrum fringed with ferruginous pubescence; the head nearly orbicular. Thorax: the metathorax clothed with pale fulvous pubescence; the wings fulvo-hyaline, the nervures and tegulæ pale ferruginous. Abdomen with a little fulvous pubescence at the base; beneath, clothed with glittering silvery pubescence.

Hab. Malacca (Mount Ophir).

Subfam. SCOPULIPEDES.

Gen. CERATINA, *Latr.*

1. *Ceratina hieroglyphica*, *Smith, Cat. Hym.* pt. 2. p. 226.

Hab. Borneo (Sarawak).

2. *CERATINA FLAVOPICTA*. *C. atra*; capite thoraceque flavo-pictis; abdomine fasciisque flavis.

Male. Length 4 lines. Black: the face, inner orbits of the eyes, clypeus, labrum, mandibles, cheeks, scape, and a minute spot above the eyes, yellow. Thorax: the prothorax, two longitudinal lines on the disk of the mesothorax, an epaulet over the tegulæ, a line on each side of the metathorax, a spot beneath the wings, the tubercles and legs, yellow; the coxæ and base of the femora slightly rufo-piceous; the wings subhyaline, the nervures ferruginous. Abdomen: the basal and apical segments, and the apical margins of the other segments, yellow; the entire insect is shining and the abdomen delicately punctured.

Hab. Borneo (Sarawak).

This species is closely allied to the *Ceratina hieroglyphica* from India, but is abundantly distinct.

Gen. XYLOCOPA, *Latr.*

1. *Xylocopa latipes*.

Apis latipes, *Drury, Ill. Exot. Ins.* ii. p. 98.

Hab. Borneo (Sarawak), India, Singapore, Ceylon, Philippine Islands, China.

2. *Xylocopa collaris*, *St. Farg. Hym.* ii. p. 189.

Hab. Borneo (Sarawak), India, Sumatra, Bengal, Malacca.

3. *XYLOCOPA ÆSTUANS*.

Apis æstuans, *Linn. Syst. Nat.* i. p. 961 ♀.

Hab. Singapore, India.

4. *Xylocopa verticalis*, *St. Farg. Hym.* ii. p. 195 ♂.

This species I believe to be the male of *X. æstuans*.

Hab. Singapore, India.

5. *Xylocopa cærulea*, *Fabr. Syst. Piez.* p. 345.

Hab. Singapore, Java, East India, China.

6. *Xylocopa Dejeanii*, *St. Farg. Hym.* ii. p. 209.

Hab. Borneo, Java.

This I have little doubt is the male of *X. collaris*: I have on several occasions observed that they have been captured at the same time and place.

7. *Xylocopa dissimilis*, *St. Farg. Hym.* ii. p. 180 ♀.

Hab. Borneo (Sarawak), China, Madras.

8. *XYLOCOPA INSULARIS*. *X. nigra*; capite thoraceque pube rufo-fusca tectis; alis nigro-fuscis iridescentibus, apice acuminatis; oculis magnis, vertice fere connexis.

Male. Length 11 lines. Black: the head and thorax densely clothed with short rufo-fulvous pubescence; the eyes very large and approximating at the vertex; the anterior legs fringed with long black pubescence behind; the intermediate and posterior legs with black pubescence, very long on the posterior tarsi; the disk of the thorax very smooth and shining; the anterior wings pointed at their apex; the wings brown, with a violet and coppery iridescence; the posterior margins palest; the transverse nervure which separates the first and second submarginal cells, obliterated. Abdomen punctured; the basal and lateral margins with a thick fringe of black pubescence, the apical margins of the segments depressed and slightly rufo-piceous.

Hab. Borneo (Sarawak).

Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*.

Apis zonata, *Linn. Syst. Nat.* i. p. 955.

Hab. Borneo (Sarawak).

2. *ANTHOPHORA INSULARIS*. *A. nigra*, pube fulva vestita, faciei pube grisea.

Female. Length 7 lines. Black: the face, cheeks and thorax beneath clothed with griseous pubescence, that on the thorax above and on the abdomen is fulvous; the fifth segment of the abdomen with a mixture of black hairs; the legs have a fulvous pubescence outside; within it is black, it is also black at the apex of the plantæ of the posterior legs. The mandibles, labrum, anterior margin of the clypeus and a narrow central longitudinal line, a minute spot above the clypeus,

and the flagellum beneath, yellow; the tegulæ yellow, the wings fulvo-hyaline.

Hab. Borneo (Sarawak).

This species closely resembles both the *A. vestita* and the *A. concinna*, but is on comparison very distinct.

Subfam. SOCIALES.

Gen. APIS, *Linn.*

1. *Apis dorsata*, *Fabr. Syst. Piez.* p. 370.

Hab. India, Borneo (Sarawak), Malacca.

2. *Apis Indica*, *Fabr. Syst. Piez.* p. 370.

Hab. India, Malacca, Borneo.

3. *Apis Perrottetii*, *Guér. Icon. Règ. Anim. Ins.* p. 461.

Hab. Borneo (Sarawak). India.

The specimens from Sarawak are of a paler colour than those described by Guérin, but they agree in all the essential specific characteristics, and have the bands of pale pubescence at the base of the segments, as in *A. Perrottetii*; these bands, if the abdomen retracts after death, are hidden beneath the apical margins of the preceding segments.

4. *APIS ANDRENIFORMIS.* *A. nigra lævis nitida*; alis hyalinis; abdomine fasciis albis pubescentibus ornato.

Worker. Length 4 lines. Black; smooth and shining, slightly pilose; the face with a short cinereous pubescence; the metathorax, the coxæ and femora beneath with whitish pubescence; the wings hyaline and iridescent; the basal margin of the second segment of the abdomen slightly rufo-piceous; the basal margins of the third, fourth, fifth and sixth segments with bands of white pubescence; beneath, the three basal segments of the abdomen pale testaceous in the middle.

Hab. Borneo (Sarawak).

This remarkable Honey-Bee has exactly the appearance of an *Andrena*; it does not appear to be a worn specimen; the wings are not torn, and the abdominal bands entire; the eyes are pubescent, but less conspicuously so than in any species I have previously seen.

5. *APIS TESTACEA.* *A. capite thoraceque nigris, abdomine pedibusque pallide testaceis, alis hyalinis.*

Worker. Length 8 lines. Head dark fuscous; the ocelli shining, yellow; the extreme base of the scape and the tips of the mandibles, as well as the tongue, of a reddish-yellow; the head covered with rufo-fuscous pubescence, that on the cheeks palest. Thorax fuscous anteriorly, the metathorax, tegulæ and legs pale rufo-testaceous; the thorax and legs with a pale yellowish-white pubescence, intermixed

with a few fuscous hairs on the disk of the mesothorax; the wings hyaline, with the nervures pale testaceous. Abdomen: pale testaceous and densely clothed with short yellowish-white pubescence.

Hab. Borneo.

A very distinct species from any hitherto described: its densely pubescent body is a distinguishing characteristic.

Genus TRIGONA, *Jurine*.

1. TRIGONA VENTRALIS. *T. nigra*; abdomine nigro-piceo; segmento basali supra, abdomine subtus albis.

Worker. Length $1\frac{2}{3}$ line. Head and thorax black; the extreme base of the scape, and the flagellum rufo-fuscous; the tips of the mandibles ferruginous; the clypeus and lower part of the face with a cinereous pile. Thorax: narrower than the head; the mesothorax margined with short whitish pubescence, the outer margin of the tegulæ rufo-piceous; the wings hyaline and iridescent, the nervures dark ferruginous; the apical joints of the tarsi pale; the posterior tibiæ broadly expanded towards their apex, their upper margin thinly fringed with pale hairs, the basal joint of the tarsi clothed with golden pubescence within. Abdomen dark rufo-piceous; the basal segment white, beneath entirely so.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. TRIGONA ATRIPES. *T. flavescenti-rufa*; alis dimidio basali fuscis, apicali lacteis, tibiis tarsisque intermediis et posticis nigris.

Worker. Length $2\frac{1}{2}$ lines. Pale reddish-yellow; the flagellum fuscous above; wings reddish-brown, with their apex beyond the stigma milky-white; the intermediate and posterior tibiæ and tarsi black, the apical joints of their tarsi ferruginous; the anterior legs entirely reddish-yellow; the scutellum fringed with fuscous hairs.

Hab. Malacca (Mount Ophir).

3. TRIGONA THORACICA. *T. nigra*; thorace obscure ferrugineo, alis flavo-hyalinis, abdomine basi pallide testaceo.

Worker. Length $3\frac{1}{2}$ lines. Black: the scape of the antennæ at the base, the clypeus and mandibles at their base, ferruginous. Thorax: obscurely ferruginous, the legs more or less ferruginous towards their base; the wings flavo-hyaline. Abdomen smooth and shining, pale testaceous at the base.

Hab. Singapore.

4. TRIGONA NITIDIVENTRIS. *T. nigra*; alis subhyalinis, coxis et unguibus pallide ferrugineis; abdomine supra nitido, nigro, subtus pallide testaceo.

Worker. Length $3\frac{1}{2}$ lines. Black: the extreme base of the scape ferruginous; the wings subhyaline and iridescent, slightly fuscous towards their base, the nervures testaceous; the margins of the thorax

and the scutellum with ochraceous pubescence; the coxæ and claw-joint of the tarsi rufo-testaceous. Abdomen shining black, its extreme base, and beneath entirely, pale testaceous.

Hab. Malacca (Mount Ophir).

5. *TRIGONA LÆVICEPS*. *T. nigra*; capite lævi et nitido, antice pube cinerea tecto; thorace nitido, alis subhyalinis, abdomine castaneo-rufo.

Worker. Length $1\frac{1}{2}$ line. Head and thorax black: the face, above the insertion of the antennæ, smooth and shining; the antennæ rufo-testaceous; the clypeus with a hoary pubescence; its anterior margin, and also the mandibles, ferruginous. Thorax smooth and shining, the metathorax highly polished; the wings subhyaline and iridescent, the stigma and nervures ferruginous. Abdomen ferruginous, smooth and shining.

Hab. Singapore.

6. *TRIGONA APICALIS*. *T. nigra*; clypeo antennisque ferrugineis, parte dimidia basali alarum fusca, apice hyalino.

Worker. Length $2\frac{1}{2}$ lines. Head and thorax black; the abdomen nigro-piceous; the clypeus, and lower parts of the face, testaceous-yellow; the mandibles ferruginous; antennæ pale ferruginous; the head covered with cinereous pile. Thorax: the tegulæ testaceous; the wings from the base to the stigma brown, beyond which they are hyaline; the scutellum covered with short stiff black hairs; the sides, and beneath, with scattered black pubescence; the legs dark rufo-piceous; the posterior tibiæ pale, flattened and widened towards their apex; the outer margin thickly fringed with black pubescence; the disk of the thorax with a cinereous pile; the apex of the abdomen pale rufo-testaceous.

Hab. Borneo (Sarawak).

7. *TRIGONA CANIFRONS*. *T. nigra*; facie pube cinerea vestita; alis hyalinis.

Worker. Length $2\frac{1}{2}$ lines. Black: the face covered with cinereous pile. The thorax thickly covered above with sooty-black pubescence, which is long and tufted on the scutellum; the tegulæ black and shining; the wings hyaline, the nervures testaceous; the posterior tibiæ, with their upper margin, thickly fringed with black hairs. Abdomen shining black.

Hab. Borneo (Sarawak).

8. *TRIGONA COLLINA*. *T. nigra*; antennis basi ferrugineis; alis basi fuscis apice albis.

Worker. Length $2\frac{1}{4}$ lines. Black: the scape, flagellum beneath, and its apex, as well as the mandibles, ferruginous; the clypeus with a pale testaceous spot in the middle; the wings brown at their base as

far as the stigma, beyond which they are milky-white ; the abdomen obscurely rufo-piceous at the base.

Hab. Malacca (Mount Ophir).

9. *TRIGONA FIMBRIATA*. *T.* capite thoraceque femoribus et abdomine basi testaceo-rufis ; tibiis tarsisque intermediis et posticis nigris.

Worker. Length $3\frac{1}{2}$ lines. Head rufo-testaceous, the face covered with very short ochraceous pubescence, and sprinkled with longer stiff black hairs ; the colour and pubescence of the thorax are similar to that of the head, but the disk is of a rather darker colour, and the black hairs are longer and more rigid ; the intermediate and posterior tibiæ, and the basal joints of their tarsi, black, the former densely covered with black pubescence, and the latter thickly fringed with the same, the posterior tibiæ being very broadly dilated towards their apex ; the wings hyaline, their nervures bright ferruginous. Abdomen : the two basal segments rufo-testaceous, their apical margins, as well as the whole of the following segments, nigro-fuscous.

Hab. Singapore.

Fam. FORMICIDÆ.

Before entering upon the descriptions of the highly interesting collection of Ants made by Mr. Wallace in Borneo, Malacca, and Singapore, a few observations may not be out of place. I am perfectly aware, that in treating upon this family, I can only achieve a very partial success ; our present knowledge, scanty as it is, convinces me that it is simply an impossibility to assimilate the sexes of the exotic Ants correctly, without positive observation of their æconomy. The sexes of some species, there can be little doubt, at present form the types of apparently very distinct genera ; such indeed are the eccentricities of form in the exotic species, as to outstrip even the widest bounds hitherto conceived to be necessary to allow, for varieties in form, size and colour. A single instance will amply confirm this observation. In the third volume of the 'Transactions of the Entomological Society,' I described eleven species of the genus *Pseudomyrma* ; of one of these I had the opportunity of describing the three sexes, taken in their formicarium by Mr. H. W. Bates, in Brazil. This species, *Pseudomyrma cephalica*, exhibits such a remarkable difference of form in the male, female and worker, that, had they not been obtained in the manner stated, I should unhesitatingly have removed the sexes into two distinct genera. In the male and worker the head is of the ordinary form and proportion, but that of the female is as long as the thorax, with the sides parallel ; it is in fact, if I may use the term, so disproportionate, that no one, I imagine, could have

possibly supposed any relationship to have existed between the female and the other sex.

It is to the *Formicidæ* that Mr. Wallace has made the most valuable additions: the number of new species added to the genus *Polyrhachis* is very important, and that of eight to the *Cryptoceridæ* makes a grand addition to that curious and highly interesting family. The new genus, *Echinopla*, being founded on the examination of workers only, will no doubt hereafter require a revision of the characters laid down, but in describing a collection containing so many novelties such occurrences are almost inevitable.

1. *Formica gigas*, Latr. *Hist. Nat. Fourm.* 105. pl. 2. f. 6 ♀.

Hab. Borneo, Malacca, Singapore.

2. *Formica compressa*, Fabr. *Syst. Piez.* p. 396.

Hab. Sarawak.

Specimens from Borneo have the legs more or less red, and in some examples the vertex is more or less so.

3. *Formica stricta*, Jerdon, *Madr. Journ. Lit. & Sci.* (1851) p. 123.

Hab. Borneo (Sarawak).

4. *Formica smaragdina*, Fabr. *Spec. Ins.* 488 ♀.

Formica longipes, Jerdon, *Madr. Journ. Nat. Hist.* 2nd ser. xiii. 104 ♀.

Formica viridis, Kirby, *Trans. Linn. Soc.* xii. 477 ♀.

Hab. Borneo (Sarawak), Malacca, Sumatra, Celebes, Philippine Islands.

5. **FORMICA FESTINA.** *F. nigra*, nitida; flagello fulvo; thorace subtus, metathorace pedibusque et petiolo pallide ferrugineis; abdomine subtus piceo.

Female. Length 9–10 lines. Black and shining: head oblong-quadrate; the mandibles and anterior margin of the face rufo-piceous; the flagellum fulvous. Thorax: beneath, the sides, the metathorax and the legs, pale ferruginous; wings subhyaline, their nervures ferruginous; scale of the abdomen pale ferruginous, ovate and slightly emarginate above; the posterior margins of the segments of the abdomen, above, pale rufo-testaceous; beneath, entirely pale.

Hab. Borneo (Sarawak).

This species closely resembles the European species *F. ligniperda*—in fact appears to be the exotic form of that insect.

6. **FORMICA MISTURA.** *F. nigro-picea*, ferrugineo variegata, pubescens; capite opaco, thorace abdomineque nitidis.

Female. Length 7 lines. Head black, the vertex and cheeks more or less ferruginous; the head opake, with the mandibles shining nigro-piceous; the scape attenuated, rufo-testaceous; the clypeus delicately punctured, slightly emarginate in front. Thorax elongate-ovate,

smooth and shining, with ferruginous stains in front and on the sides; the metathorax truncate, with ferruginous spots at its base above; the legs ferruginous, the tibiæ and basal joint of the tarsi darkest; the wings flavo-hyaline, the nervures pale rufo-testaceous. Abdomen elongate-ovate, with the margins of the segments and the apex rufo-piceous; the scale ferruginous, with its superior margin very slightly emarginate; the head with a thin fulvous pubescence; the abdomen with a few scattered pale hairs.

Hab. Borneo (Sarawak).

7. *FORMICA PILOSA*. *F. nigra*, dense sericea pilosa; squama ovata.

Worker. Length 3 lines. Black, covered with a fine cinereous pile: the head large, much wider than the thorax; eyes ovate, placed laterally rather high on the head; the anterior part of the face truncate, the sides produced beyond the anterior margin of the clypeus; a faintly impressed line above the base of the clypeus, which terminates in a shallow fovea on the front. Thorax compressed posteriorly. Abdomen ovate, with a short pale pubescence; the scale narrow, incrassate, and terminating above in a blunt point.

Hab. Borneo (Sarawak).

8. *FORMICA RUFICEPS*. *F. nigra*; capite thoraceque antice ferrugineis.

Worker. Length 4 lines. Head ferruginous, smooth, shining, and much wider than the thorax; the mandibles and scape black, the apex of the former obscurely ferruginous; the flagellum pale rufo-testaceous. Thorax black, more or less ferruginous anteriorly, much compressed towards the metathorax; the tips of the joints of the legs ferruginous, as well as the tarsi. Abdomen black, smooth and shining; the scale ovate, acuminate at its apex above; the legs and apex of the abdomen with a scattered short pale pubescence.

Worker minor, about one-third smaller; only differs otherwise in having the mandibles ferruginous.

Hab. Borneo (Sarawak).

This species bears a strong resemblance to the *F. erratica* of Europe.

9. *FORMICA BADIA*. *F. castaneo-fusca*; thorace postice attenuato, abdominis squamula incrassata, abdomine ovato.

Worker. Length $2\frac{1}{2}$ – $3\frac{1}{2}$ lines. Chestnut-brown; head subovate; the eyes ovate, lateral, placed high on the head towards the vertex. Thorax rounded in front, compressed behind; the metathorax obliquely truncated; the scale of the abdomen subconical, incrassate, slightly rounded in front and truncate behind. Abdomen oblong-ovate, the apex fuscous.

Hab. Singapore; Borneo (Sarawak).

This species has much the appearance of a species of *Polyergus*; but the mandibles are toothed at the apex: the palpi I have not examined.

10. *FORMICA DILIGENS*. *F.* obscure rufo-picea; antennis, mandibulis, thorace subtus et lateribus, metathorace pedibusque læte rufis; abdomine subtus pallide rufo-testaceo.

Female. Length 9 lines. Head shining, dark rufo-piceous; the carinae at the insertion of the antennæ, the antennæ, the anterior margin of the face and clypeus, and the mandibles, ferruginous. The thorax and legs ferruginous, with the mesothorax above and the scutellum dark rufo-piceous; wings subhyaline, the nervures and tegulæ pale ferruginous. Abdomen shining dark rufo-piceous, beneath pale rufo-testaceous; scale subquadrate, its superior margin slightly emarginate its entire width.

Hab. Malacca.

This insect closely resembles the *F. ligniperda*.

11. *FORMICA IRRITANS*. *F.* capite abdomineque nigro-fuscis; antennis, thorace, abdomine, squamula pedibusque ferrugineis.

Worker. Length 6 lines. Elongate and slender; head ovate; dark fuscous; the apex of the scape and the flagellum ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax, scale of the abdomen and the legs, ferruginous; the thorax elongate, compressed, with the prothorax very slightly dilated at the sides. The scale of the abdomen incrassate, rounded anteriorly and truncate behind. Abdomen ovate, nigro-fuscous; the entire insect sprinkled with erect pale hairs.

Worker minor. Length 3 lines. Only differs in having the antennæ entirely pale ferruginous and the anterior legs stouter.

Hab. Malacca; Borneo (Sarawak).

This is probably the worker of *F. diligens*.

12. *FORMICA FERVENS*. *F.* capite abdomineque obscure rufo-piceis, thorace pedibusque pallide ferrugineis.

Worker. Length 4 lines. Head nigro-piceous, thorax and legs pale ferruginous; head subopake, with the mandibles and clypeus slightly shining, the latter with scattered punctures; the flagellum pale ferruginous; the anterior margin of the clypeus slightly emarginate. Thorax more or less fuscous in front, compressed behind. Abdomen black and shining, with the apical margins of the segments narrowly testaceous; thinly sprinkled with pale hairs; the scale ovate and ferruginous.

Hab. Borneo (Sarawak).

13. *FORMICA GRACILIPES*. *F.* ferruginea, abdomine (basi excepto) obscure rufo-piceo.

Worker. Length 2 lines. Pale ferruginous, abdomen dark rufo-piceous; antennæ longer than the body; head ovate, and wider than the thorax, narrowed behind; the eyes black and prominent. Thorax elongate and compressed; the prothorax narrowed into a slender neck;

legs very much elongated, the posterior pair one-third longer than the insect, the tibiæ and tarsi pale testaceous; the abdominal scale incrassate, rounded in front and truncate behind; the abdomen dark rufo-piceous, short and ovate; the base more or less pale ferruginous.

Hab. Singapore.

14. *FORMICA IRRITABILIS*. *F.* capite, thorace et squama sanguineis; pedibusque rufo-fuscis; abdomine fusco-nigra.

Worker. Length 4 lines. Head, thorax, and scale of the abdomen ferruginous, the abdomen black; the scape black, its extreme base and apex, and the flagellum, ferruginous, the latter more or less fuscous above; the vertex with sometimes a fuscous stain; the mandibles nigro-piceous, their apex ferruginous; the thorax compressed behind, and thinly covered, as well as the head, with erect reddish hairs; legs nigro-fuscous, with the base and apex of the joints, or with sometimes the coxæ and base of the femora, and also the apical joints of the tarsi, ferruginous. The scale of the abdomen ovate, terminating in a point above; the apical margins of the segments with a thin fringe of pale reddish-yellow hairs.

Hab. Borneo (Sarawak).

15. *FORMICA SEDULA*. *F.* capite thorace pedibusque opacis nigris, abdomine castaneo.

Worker. Length 5 lines. Head and thorax opaque-black, the mandibles and legs shining black; the abdomen chestnut-red. The mandibles smooth at their base, and striated at their apex, with five stout teeth, the flagellum fusco-ferruginous; the head deeply emarginate behind; much wider than the thorax; the thorax compressed; the trochanters and apical joints of the tarsi ferruginous. Abdomen ovate and thinly sprinkled with reddish pubescence; the scale subquadrate; emarginate above, and slightly ferruginous; the head and thorax with a few erect black hairs.

Hab. Borneo (Sarawak).

Resembles *F. compressa*, but differs in having much stouter legs, in being pubescent, in having the posterior angles of the head more rounded, and in being pubescent.

16. *FORMICA EXASPERATA*. *F.* capite thorace abdominisque squama sanguineis; tarsorum unguibus abdominisque basi rufis; thorace compresso.

Worker. Length $5\frac{1}{2}$ lines. Head and thorax blood-red; sometimes blackish before the insertion of the antennæ, and also a little in front of the anterior stemma; in some examples entirely red; the mandibles black, stout, strongly toothed and punctured; the head deeply emarginate posteriorly, and much wider than the thorax. Thorax: compressed, sometimes with fuscous stains at the sides, with the tibiæ and tarsi more or less fuscous; the head, thorax and legs with a thin scattered pale reddish pubescence. Abdomen: black, subopaque,

with the apical margins of the segments usually more or less rufo-piceous; the scale erect, ovate and entire.

Hab. Borneo (Sarawak).

The general form of this species is that of *F. compressa*; the antennæ are shorter, with shorter joints, and the legs are considerably stouter.

Hab. Borneo (Sarawak).

17. *FORMICA TENUIPES*. *F. castaneo-rufa lævis nitida*; thorace ovato; alis hyalinis; squama quadrata supra emarginata.

Female. Length 4 lines. Reddish-brown: mandibles stout, and armed with five stout black teeth; antennæ pale rufo-testaceous. Thorax ovate, smooth and shining; wings hyaline, the nervures pale testaceous; legs pale rufo-testaceous, with the femora much compressed, flattened; the scale of the abdomen quadrate, emarginate above. Abdomen ovate, smooth and shining.

Hab. Borneo (Sarawak).

18. *FORMICA CAMELINA*. *F. nigra, elongata et gracilis*; capite postice in collum angustato; thorace medio compresso; metathorace supra rotundato; pedibus elongatis; abdominis nodo globoso.

Worker. Length 5 lines. Black: elongate and slender; covered with a fine silky pile, which has a golden tinge on the thorax and abdomen; the antennæ nearly as long as the body; the head oblong, much narrowed behind the eyes, the latter nearly round, and placed rather forwards on the face a little higher than the insertion of the antennæ; the carinæ above the clypeus with a less elevated one between them, the antennæ inserted at the sides of the carinæ. Thorax: much narrowed in front, forming a sort of neck, widened and rounded behind, broader than the meso- and meta-thorax, the latter somewhat swollen above and elevated above the anterior part of the thorax; legs very long and sprinkled with fine whitish hairs. The scale of the abdomen, viewed above, pear-shaped, broadest at the base; abdomen ovate, pointed at the apex, and sprinkled with pale glittering hairs.

Hab. Singapore,

19. *FORMICA PALLIDA*. *F. pallide testacea lævis nitida sparse pilosa*; squamula elongato-ovata.

Worker. Length $2\frac{1}{2}$ –3 lines. Pale rufo-testaceous, smooth and shining: the head much wider than the thorax, the vertex widely and deeply emarginate; the mandibles dark rufo-piceous; the flagellum and the legs paler than the rest of the body; the thorax compressed behind; the scale narrow and ovate; abdomen subglobose, and thinly sprinkled with long pale hairs; the head and thorax also slightly pubescent.

Ha b. Borneo (Sarawak).

Some individuals of this species differ from the form described, in having the head and abdomen of a deeper hue; the prothorax is sometimes

dark, but all have the scale of the same elongate-ovate form, without any notch above.

20. *FORMICA IRRITANS*. *F. nigra*; antennis, thorace pedunculisque squama ferrugineis.

Worker. Length 6 lines. Head and abdomen nigro-fuscous; antennæ, thorax, and scale of the abdomen, as well as the legs, ferruginous. Elongate and slender, the head ovate; the apex of the scape ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax elongate, compressed, with the prothorax slightly dilated at the sides. Abdomen ovate: the scale incrassate, rounded anteriorly, and truncate behind; the entire insect thinly sprinkled with erect, long, pale pubescence.

Worker (minor). Length 3 lines. This only differs in having the antennæ entirely pale ferruginous.

Hab. Borneo (Sarawak).

This is probably the worker of *Formica diligens*.

Genus *TAPINOMA*, *Foerster*.

1. *TAPINOMA GLABRATA*. *T. nigra*, subnitida, glabra, angustior; antennis, mandibulis tarsisque rufo-pallidis; squama oblonga depressa; abdomine oblongo-ovato.

Worker. Length $1\frac{1}{2}$ line. Black: the clypeus obscurely testaceous; the mandibles and flagellum rufo-testaceous, the apex of the latter slightly fuscous; the head, prothorax, and coxæ beneath, rufo-testaceous; the thorax declining above to the base of the metathorax, the latter convex; the tarsi pale rufo-testaceous. Abdomen ovate; the scale inclining forwards in a line with the oblique truncation of the metathorax; the insect entirely destitute of pubescence.

Hab. Malacca.

Genus *POLYRHACHIS*.

Body more or less armed with spines. *Antennæ* elongate, usually nearly as long as the body; *labial palpi* 4-jointed, the basal joint shortest, the three following, each in succession, longer than the preceding; the apical joint three times the length of the basal one. *Maxillary palpi* 6-jointed, elongate, the basal joint short, about half the length of the second joint, each of the following joints more than twice the length of the second joint. *Thorax*: subovate in the females; compressed and frequently flattened above in the workers; *wings* as in *Formica ligniperda*. *Abdomen* globose. (Details, Plate I.)

This genus of Ants, of which the *Formica bihamata* may be regarded as the type, forms a very distinct section of the *Formicidæ*: the males I am not acquainted with. The habit of these insects is arboreal, as we learn from Mr. Jerdon, who, in his paper on Ants, in the Madras Journal, describes two species; of

one, *P. nidificans*, he says, "This Ant makes a small nest about half an inch or rather more in diameter, of some papyraceous material, which it fixes on a leaf; I have opened two, each of which contained one female and eight or ten workers. It is very rare; I have only seen it in Malabar." What can be the use of the formidable spines and hooks with which these creatures are armed, it is impossible to determine; on examination we find, as might be expected in species living on trees, and probably all have the same habit, that the legs are destitute of spines, and usually of pubescence also; the calcaria at the apex of the tibiæ are very short, and the tips of the tarsal joints have very short spines and hairs.

The *Polyrhachis textor*, described in these papers, was captured with its nest, and was sent from Malacca by Mr. Wallace; the nest is nearly oval, not quite an inch in length, its shortest diameter being a little over half an inch; this nest is not of a papyraceous texture, but fibrous, formed, as it were, of a coarse network; the colonies must consequently be very small, as Mr. Jerdon says, consisting of only eight or ten individuals; but probably at the height of the season, when the males appear, the nests may be somewhat enlarged, as we know to be the case amongst the social Wasps.

Although these insects are usually rare, or at least seldom met with in collections, Mr. Wallace has captured no less than nineteen species in the East: from the New World I have only seen one or two, about four from Africa, and the same number from Australia.

1. *POLYRHACHIS BIHAMATUS*, *Drury, Ins. ii. pl. 38. f. 8 ♀*.

P. thorace quadrispinoso, squama petiolari spinis duabus arcuatis.

Hab. Borneo. India. Sumatra.

2. *Polyrhachis relucens*.

Formica relucens, Latr. Hist. Nat. Fourm. p. 131.

Hab. Borneo (Sarawak). India.

3. *Polyrhachis carinatus*.

Formica carinata, Fabr. Syst. Piez. 413. 71; St. Farg. Hym. i. 220. 28;

Jerdon, Madras Journ. Lit. & Sc. (1851).

Hab. Malacca. Singapore.

4. *POLYRHACHIS DEFENSUS*. *P. niger*; capite thoraceque minute verrucatis, thorace spinis duabus longis antice, duabus postice, armato; abdomine opaco ferrugineo-rufo.

Worker. Length $3\frac{1}{2}$ lines. Head and thorax black, and coarsely sha-

greened; the thorax armed with two long stout spines at the angles of the prothorax, and two similar ones at the posterior angles of the metathorax; the scale of the abdomen with two long stout spines diverging and curved backwards. Abdomen globose, of a dull opake rusty-red.

Hab. Singapore. Java.

Specimens from Java, in the British Museum, have the abdomen black.

5. *POLYRHACHIS CONSTRUCTOR*. *P. niger*; thorace ovato, spinis duabus minutis antice armato; abdominis squamula spinis duabus armata.

Female. Length $3\frac{1}{2}$ lines. Black: finely rugose; the palpi pale testaceous; the mandibles obscurely rufo-piceous; the apex of the antennæ pale rufo-testaceous. Thorax: the anterior angles of the prothorax acute; the metathorax not toothed; the apex truncate, the truncation finely rugose; wings subhyaline, faintly yellow; the nervures pale testaceous. Abdomen globose; the scale quadrate, with two very stout, short, curved spines above; the insect is very thinly covered with a fine short silky ashy pile, most apparent on the abdomen.

Hab. Borneo (Sarawak).

6. *POLYRHACHIS RUFICORNIS*. *P. niger*; antennis mandibulis pedibusque ferrugineis, abdominis squamula spinis duabus longis armata.

Female. Length 4 lines. Black: the antennæ and mandibles ferruginous. Thorax elongate-ovate; wings subhyaline and iridescent, the nervures testaceous; the legs ferruginous, the coxæ black. Abdomen: the base more or less ferruginous; the scale with two stout divergent spines above, which curve slightly backwards.

Hab. Borneo (Sarawak).

7. *POLYRHACHIS CARBONARIUS*. *P. aterrimus*, nitidus; capite thoraceque supra aciculatis, abdominis squamula supra fornicata.

Worker. Length 2 lines. Jet-black, shining: the head and the thorax above, longitudinally aciculate, the thorax most finely so. Thorax: the anterior margin of the thorax with a short acute spine at the lateral angles; the truncation of the metathorax smooth and shining; the legs elongate, with acute spines or hairs; the calcaria pale testaceous; the anterior tibiæ obscurely ferruginous in front. Abdomen ovate, smooth and shining; the scale incrassate, narrowed to a sharp edge above, the superior margin wide and arched, not spined.

Hab. Malacca.

8. *POLYRHACHIS TEXTOR*. *P. niger*; thorace elongato, supra planato, dentibus duobus parvis antice et postice armato; abdominis pedunculo unispinoso.

Worker. Length $3\frac{1}{2}$ lines. Black; delicately rugulose; the eyes ovate, lateral, placed high on the sides of the head; the front with two raised carinæ, at the sides of which the antennæ are inserted; the

clypeus and the space between the antennæ, rufo-piceous; the clypeus with a slight longitudinal carina; the mandibles obscurely rufo-piceous at their apex; the apical joint of the antennæ ferruginous. Thorax elongate, compressed at the sides, and flattened above; the anterior portion longitudinally aciculate; the meso- and meta-thorax delicately rugulose; a short blunt tooth or spine on each side of the prothorax, and a similar, but more acute tooth at the superior angles of the metathorax; the legs elongate, without spines or hairs; the tips of the claw-joint of the tarsi ferruginous. Abdomen smooth and shining; the peduncle with a single acute spine above, and a minute tooth on each side at its base.

Hab. Malacca.

9. *POLYRHACHIS CHALYBEUS*. *P. capite thoraceque nigris, pedibus abdomineque chalybeis.*

Worker. Length 4 lines. Black: the metathorax, legs and abdomen steel-blue; the head delicately rugulose; eyes ovate, lateral, placed high on the head; the antennæ inserted opposite the lower orbit of the eyes, each at the side of an elevated bent carina; the clypeus emarginate anteriorly; the mandibles large and stout, their apex denticulate. Thorax elongate, delicately transversely rugulose, with two stout acute spines in front, diverging outwardly, and two shorter erect parallel ones on the metathorax; the femora and tibiæ compressed. Abdomen smooth and shining; the peduncle armed with two long stout divergent bent spines which curve backwards.

Hab. Singapore. Malacca.

10. *POLYRHACHIS NITIDUS*. *P. nigerrimus, lævis, nitidus; thorace ovato, metathorace spinis duabus longis acutis, pedunculo quadrato, spinis duabus curvatis acutis armato.*

Female. Length 4 lines. Jet-black, smooth and shining; the thorax rounded anteriorly; the metathorax armed with two long acute spines at its base; the truncation delicately transversely rugulose and shining; the peduncle quadrate, armed above at its posterior angles with two short curved acute spines; the anterior tibiæ rufo-piceous in front; wings subhyaline, faintly tinted with yellow; the nervures ferruginous; the stigma brown. Abdomen subglobose, very smooth and shining.

Hab. Borneo (Sarawak).

11. *POLYRHACHIS VILLIPES*. *P. niger; thorace spinis duabus elongatis acutis antice armato; abdominis squamula spinis duabus longis acutis, singulis basi minute unispinosis, pedibus pubescentibus.*

Worker. Length $3\frac{1}{2}$ –4 lines. Black: the head and thorax longitudinally delicately aciculate; eyes ovate, very prominent, situated high on the sides of the head, the head narrowed posteriorly; the carinæ on the face much elevated; the palpi pale rufo-testaceous. Thorax: armed in front with two long acute divergent spines; posteriorly unarmed; the superior surface flattened, distinctly divided by two trans-

verse sutures, and having a curved decline to the verge of the truncation of the metathorax; legs elongate, with a thin clothing of erect pubescence. Abdomen smooth, shining, and sprinkled with erect black hairs; the surface of the peduncle in front subquadrate, narrowed at the base, the superior angles with long acute divergent spines, which have a minute spine at their base outside.

Hab. Borneo (Sarawak).

12. *POLYRHACHIS MODESTUS*. *P. niger*; thorace ovato, metathorace spinis duabus brevibus obtusis, squama spinis duabus acutis retrorsum curvatis armata.

Female. Length 3 lines. Black: head and thorax very delicately rugose; the flagellum rufo-piceous beneath towards the apex. Thorax ovate; the metathorax with two short blunt spines; wings hyaline, faintly yellow; the nervures pale testaceous; the apical joints of the tarsi obscurely ferruginous. Abdomen globose, smooth and shining; the scale quadrate, armed above at the lateral angles with two acute spines which curve backwards.

Hab. Singapore.

13. *POLYRHACHIS PANDARUS*. *P. opacus niger*; capite thoraceque subverrucatis, thorace antice posticeque abdominisque squama spinis duabus longis crassis acutis armatis.

Worker. Length 4 lines. Black: head and thorax coarsely shagreened; the palpi pale testaceous; head below the antennæ finely shagreened; the head with a sharp recurved margin posteriorly. Thorax: not flattened above; two long, stout, acute, divergent spines in front, and two similar ones posteriorly; the scale quadrate, with two long acute divergent spines, directed backwards; legs without spines or hairs; the calcaria, at the apex of the anterior tibiæ, pale testaceous, those on the intermediate and posterior pairs black. Abdomen smooth, opaque-black.

Examples of this species from Singapore have the abdomen rusty-red.

Hab. Borneo (Sarawak). Philippine Islands. Java.

14. *POLYRHACHIS HECTOR*. *P. opacus niger*; thorace spinis duabus longis acutis antice et postice armato; squama quadrata spinis duabus longis curvatis; abdomine obscure ferrugineo.

Worker. Length 4 lines. Opaque-black: delicately shagreened; the head narrowed posteriorly; the thorax armed with two long acute divergent spines in front, and two slightly divergent ones behind; the scale quadrate, with two long divergent spines above which curve backwards; the legs without spines or pubescence, the calcaria black. Abdomen with an obscure ferruginous tinge. Thorax not flattened above.

Hab. Singapore.

15. *POLYRHACHIS LÆVIGATUS*. *P. niger*, lævis, nitidus; metathorace

spinis duabus longis acutis retrorsum directis; abdominis squama spinis duabus curvatis armata; coxis femorumque basi rufis.

Worker. Length $2\frac{1}{2}$ lines. Black, smooth and shining; the flagellum thickened towards the apex. Thorax: the anterior angles acute; the disk not flattened; the metathorax with two long, acute, divergent spines, directed backwards; the scale with a long curved spine on each side, directed to the curve of the abdomen; the coxæ and femora ferruginous, the anterior pair obscure. Abdomen globose, smooth and shining.

Hab. Malacca.

I have only seen a single specimen of this species: the clavate antennæ appear to indicate its belonging to a different genus.

16. *POLYRHACHIS CUSPIDATUS.* *P. niger*; prothorace metathoraceque medio elevatis et bispinosis; femoribus abdominisque basi ferrugineis.

Worker. Length $2\frac{1}{2}$ lines. Black: head subovate, not narrowed behind; the base of the scape, the apex of the flagellum, and the tips of the mandibles, ferruginous. Thorax slightly compressed; the prothorax with an elevation in the middle which terminates above in two divergent spines; there is also a similar elevation, spined above on each side, on the metathorax; the coxæ, femora, and apical joints of the tarsi, ferruginous. Abdomen ferruginous at the base; the scale quadrate, deeply notched above.

Hab. Borneo (Sarawak).

17. *POLYRHACHIS FLAVICORNIS.* *P. niger*; capite thoraceque subopacis, abdomine nitido; flagello femorumque basi flavo-testaceis.

Female. Length 3 lines. Black: the head subopake, the flagellum and mandibles reddish-yellow; the basal joint of the flagellum, except its extreme apex, black; the scape rufo-piceous. Thorax subopake; ovate, without spines; legs rufo-piceous, the femora pale reddish-yellow; wings subhyaline, nervures pale testaceous, stigma brown. Abdomen fuscous; the scale quadrate, armed with two short, curved subacute spines.

Worker. Length 2 lines. Very like the female, but with the antennæ and legs of a deeper tint; the first joint of the flagellum black, except its apex; the thorax flattened at the sides, the superior surface slightly convex, divided by two transverse sutures, the margins acute. Abdomen globose, black and shining; the scale as in the female.

Hab. Singapore.

18. *POLYRHACHIS EQUINUS.* *P. niger nitidus*; thorace supra depplanato, metathorace et pedunculo bispinosis, pedibus pallide ferrugineis.

Worker. Length 3 lines. Black; head shining and delicately rugulose; the palpi pale rufo-testaceous. Thorax: flattened above, the margins acutely edged; the sides longitudinally delicately striated; the pro-

thorax, above, slightly concave, and shaped like a horse-shoe; the metathorax is also slightly concave, with the posterior angles acute and elevated; the metathorax smooth and shining behind; the legs rufo-testaceous. Abdomen: smooth, shining and subglobose; the scale elevated, with two short teeth above, the sides oblique; the scale narrowing to its base.

Hab. Sarawak.

19. *POLYRHACHIS DIVES*. *P. niger*, aureo-sericeo vestitus; thorace spinis acutis antice et postice armatis; squama quadrata spinis duabus longis curvatis.

Worker. Length $2\frac{1}{2}$ lines. Black: clothed with pale golden pubescence; the thorax with two short curved spines in front, and two of about the same length at its posterior margin; the scale of the abdomen compressed, square in front, and having two long spines which curve backwards; the pubescence on the head and thorax with an obscure golden tinge; the legs without spines or pubescence; the calcaria pale testaceous.

Hab. Singapore.

20. *POLYRHACHIS VINDEX*. *P. niger*, subnitidus; thorace supra deplanato, spinis duabus anterioribus; squama integra; pedibus ferrugineis; tibiis et femoribus apice tarsisque fuscis.

Worker. Length $2\frac{1}{2}$ lines. Black: the head and thorax with a shining hoary pile; the head longitudinally striated; the apex of the flagellum beneath, and the palpi, pale rufo-testaceous. Thorax flattened above, delicately striated longitudinally; the divisions of the thorax distinctly marked by two transverse sutures; the lateral margins raised and acute; the anterior angles produced into acute spines; the tibiæ and femora ferruginous, and more or less fuscous at their apex. The scale of the peduncle incrassate, compressed to a sharp edge above, which is rounded, and terminates in a minute tooth laterally. Abdomen smooth, shining and subglobose.

Hab. Borneo (Sarawak).

Subfam. Poneridæ.

Gen. ODONTOMACHUS, *Latr.*

1. *ODONTOMACHUS RIXOSUS*. *O. rufo-fuscus*, femoribus pallide testaceis; margine interna mandibulorum subserrata, thorace transversim striato.

Worker. Length $4\frac{1}{2}$ lines. Reddish-brown: the coxæ, trochanters and femora pale testaceous, the extreme base, and apex of the latter, darker; the mandibles with two blunt teeth at their apex, the outer tooth notched on one side, forming a second tooth; the inner edge slightly serrated, having only four or five minute teeth; the prominence between the sulcations on the anterior part of the head,

obliquely striated; the striations crossing the sulcations, but terminating opposite the hinder margin of the eyes; the depression on the sides of the head striated, the striation becoming obsolete at the sides of the head. The thorax transversely striated, the metathorax most strongly so. The scale of the abdomen conical, terminating above in an acute spine; the abdomen very smooth and shining, the apex pale testaceous.

Hab. Singapore.

This species bears a strong resemblance to the type of the genus, *O. hæmatodes*, a South American insect; but that species has the head shorter, and the vertex delicately striated; the antennæ are shorter, the joints shorter: specimens which I consider to be identical with the present species, are in the collection at the British Museum, from Birmah and Singapore.

2. *ODONTOMACHUS RUGOSUS*. *O. rufescenti-fuscus*; capite supra longitudinaliter striato, lateribus lævibus nitidis, thorace pedunculoque rude rugosis.

Worker. Length 3 lines. Head of a red-brown, the mandibles and scape rather paler, the flagellum pale testaceous; the mandibles much narrowed at their base, their inner edge finely serrated, terminating in two long blunt teeth which are abruptly curved at right angles with the jaws; the head a little longer than broad, deeply emarginate behind, longitudinally striated above, the sides smooth and shining. Thorax darker than the head, and coarsely rugose; the legs ferruginous. The node of the abdomen conical and rugose; abdomen smooth and shining and of a dark rufo-piceous colour, the apex pale.

Hab. Singapore.

This is a very remarkable and distinct species, both in sculpture and form.

Gen. *PONERA*, *Latr.*

1. *PONERA VERSICOLOR*. *P. purpureo et violaceo variegata seu obscure cerata*; capite, thorace abdominisque basi profunde striatis; nodo spinis duabus parvis armato.

Worker. Length $4\frac{1}{2}$ lines. Black, with purple, violet and green tints in different lights: the head deeply striated longitudinally, the striæ terminating at the base of the clypeus, the anterior margin of which is subangular; the mandibles obscure ferruginous, their inner edge toothed, the teeth being alternately one large and one small; the mandibles finely striated; the eyes ovate, of moderate size, placed laterally about the middle. Thorax: in front with deep circular striæ, behind which are a few longitudinal ones on the disk; the sides and posterior portion obliquely striated, the apex transversely so; the calcaria and apical joints of the tarsi ferruginous. The node of the abdomen incrassate, rounded in front and above, and truncate behind,

with two short sharp spines on the verge of the truncation, pointing backwards; the first segment with transverse curved striæ.

Hab. Borneo (Sarawak). Philippine Islands.

Some specimens of this species are entirely of a bronze-green, and some have the legs more or less red.

2. *PONERA RUBRA*. *P. castaneo-rubra*, lævis et impunctata; abdomine elongato-ovato, nodo elevato antice rotundato, postice truncato.

Female. Length $3\frac{1}{2}$ lines. Bright chestnut-red; the head smooth and impunctate; the head dusky before the ocelli; the mandibles serrated on their inner margin; the antennæ about the length of the thorax, slightly thickened towards their apex. Thorax: the disk slightly fuscous; narrowed towards the metathorax, which is obliquely truncate, the truncation smooth and shining; the anterior margin of the prothorax rounded. The peduncle of the abdomen, viewed sideways, is wedge-shaped, its front margin slightly rounded, behind truncate; the abdomen elongate-ovate, pointed, and slightly pubescent at the apex.

Hab. Singapore.

3. *PONERA APICALIS*. *P. nigra*; antennis mandibulis pedibus abdominis apice ferrugineis.

Female. Length $3\frac{1}{2}$ lines. Black: the antennæ, mandibles, legs and apex of the abdomen ferruginous; the head finely shagreened. Thorax oblong-ovate, finely longitudinally rugulose; the sides of the metathorax coarsely rugose, the truncation transversely striated; the scale of the abdomen incrassate, rounded above, transversely striated in front and behind; the abdomen smooth and shining, with a thin fine grey pubescence.

Hab. Borneo (Sarawak).

4. *PONERA IRIDESCENS*. *P. rufo-fusca*, lævis, nitida, chalybeo-iridescent; antennis pedibusque ferrugineis.

Worker. Length $2\frac{1}{2}$ lines. Dark rufo-fuscous, with changeable tints of blue on the head and thorax, in different lights; the apex of the metathorax, the legs, antennæ, and apical margins of the segments of the abdomen, ferruginous; the head with an abbreviated impressed line above the insertion of the antennæ; the mandibles with their inner margin serrated and three teeth at their apex; the scale of the abdomen compressed, elevated, and rounded above. Abdomen oblong; the apical margin of the first segment slightly constricted.

Hab. Borneo (Sarawak).

5. *PONERA RUGOSA*. *P. ferruginea* rude rugosa; capite thoraceque profunde punctatis; abdomine rude sulcato et punctato.

Female. Length $3\frac{1}{4}$ lines. Ferruginous; the head covered with coarse deep punctures, the punctures semi-confluent; the antennæ short and thick; the flagellum clavate and pubescent; the mandibles longitudinally

grooved. Thorax oblong, widest in front, the anterior margin curved, the lateral angles acute; the metathorax truncate; the prothorax with large deep confluent punctures; the mesothorax longitudinally grooved; the scutellum and metathorax ruggedly punctured. The abdomen longitudinally grooved, the grooves on the basal segment punctured; the node rugged and subglobose, beneath, furnished with a remarkable flattened semitransparent appendage.

Hab. Borneo (Sarawak).

6. *PONERA RUFIPES*, *Jerdon*. *P. atro-fusca*; capite thorace nodoque rugosis; abdomine longitudinaliter rude sulcato, pedibus abdominisque apice ferrugineis.

Worker. Length 5 lines. Obscure fuscous, scarcely black; the mandibles, the apex of the scape and of the flagellum, the legs and apex of the abdomen, obscurely ferruginous; the head, thorax, and node of the abdomen, rugose; the eyes small, placed forwards on the sides of the head; the antennæ short and thick, the flagellum clavate; two parallel longitudinal carinæ running backwards from the insertion of the antennæ to within about one-third of the posterior margin of the head. The thorax obliquely truncated behind, the truncation smooth and slightly shining; the truncation of the abdominal node smooth and shining, its margin denticulated; the abdomen coarsely grooved longitudinally.

Hab. Singapore. Malabar.

Specimens of this species from Borneo have the legs nearly or quite black.

7. *PONERA INTRICATA*. *P. nitida nigra*; capite, thorace abdominisque basi profunde et æqualiter striatis; nodo spinis duabus acutis armato; pedibus ferrugineis.

Worker. Length 5 lines. Black and shining; the mandibles, legs, and apex of the abdomen, ferruginous; the flagellum obscurely ferruginous; the head evenly and deeply grooved, longitudinally on the face, and transversely on the vertex; the antennæ as long as the insect. Thorax: the dilated portion with transverse grooves on the disk which are enclosed by curved ones; the thorax is much compressed, with a longitudinal groove above, the sides obliquely striated; the oblique truncation at the apex transversely striated. The node of the abdomen compressed, rounded above and in front, and obliquely grooved; the margin of the truncation with two acute spines above directed backwards; the basal segment of the abdomen with curved striæ, slightly impressed or obliterated at the sides; the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

8. *PONERA GEOMETRICA*. *P. nigro-ænea*; capite, thorace abdominisque basi profunde striatis, nodo spinis duabus acutis armato.

Worker. Length 5 lines. Black, with more or less of a bronze tint; the head longitudinally striated; the clypeus angulated in front; the

mandibles ferruginous. Thorax: rounded anteriorly; the disk in front transversely striated, these striæ encircled by others which pass round the sides and front; the thorax beyond with a striation, which runs in an elongated oval direction, the sides obliquely striated; the legs very obscurely ferruginous. Abdomen: the node incrassate, rounded in front and above, truncated behind; the margin of the truncation deeply emarginate, the lateral angles of the emargination produced into long stout acute spines; the node with a curved striation, the curve being forwards; the first segment with a beautiful even curved striation; the apical segments smooth and shining, covered with a cinereous silky pubescence.

Hab. Singapore.

This species resembles the *P. versicolor*, but is much more regularly and evenly striated; the striation on *P. versicolor* is coarse and uneven, and directed differently on the thorax; the joints of the antennæ in this species are also longer and more slender. T. C. Jerdon has described a striated species of *Ponera*, but he says, "abdominal pedicle raised, pointing forwards with two small spines"—which does not agree with any of the insects here described.

9. *PONERA TRANSVERSA*. *P.* obscure rufo-fusca; thorace supra transverse rugoso; pedunculo margine supra emarginato.

Worker. Length 4 lines. Black: the head deeply striated, the striæ on the vertex diverging from the centre; the antennæ scarcely as long as the thorax, inserted at the side of two ridges at the base of the clypeus; the elevations, extreme base of the scape, and the mandibles, obscurely ferruginous. Thorax elongate, the sides straight, slightly narrowed from the front towards the abdomen; the margin of the thorax, in front, rounded, the lateral angles furnished with a short obtuse spine; the thorax is transversely striated its entire length; the verge of the oblique truncation at the apex with two very short obtuse spines; the legs ferruginous. Abdomen obscurely rufo-piceous, covered with a fine cinereous pile, and sprinkled with long pale hairs; the scale, when viewed sideways, is wedge-shaped, the upper edge deeply notched, and the scale transversely striated behind.

Hab. Singapore.

10. *PONERA VIDUA*. *P.* rufescenti-fusca; antennis elongatis; thorace ovato, postice truncato; alis hyalinis; abdominis nodo incrassato, subtus spinis duabus parvis armato.

Male. Length 4 lines. Red-brown: antennæ elongate, fusco-ferruginous, the base, and apex of the joints, pale testaceous; the eyes large and ovate, the ocelli large and of glassy brightness. Thorax ovate, with a thin loose downy pubescence; the metathorax truncate, the sides rugose; wings hyaline, the nervures pale yellow, with the

stigma brown; the legs pale testaceous. Abdomen smooth and shining, with thin scattered long pale pubescence, most dense towards the apex; a deep strangulation between the first and second segments; the node incrassate, coarsely rugose, rounded in front and above, truncate behind; beneath furnished with two short teeth.

Hab. Borneo (Sarawak).

11. *PONERA DIMINUTA*. *P. nigra*; vertice delicatule curvato-striato; pedibus rufo-piceis; abdomine lævigato nitido squama quadrata.

Worker. Length 3 lines. Black: the mandibles, and the extreme base of the scape, ferruginous; the flagellum fusco-ferruginous; the head elongate, narrowed behind, delicately striated; the striæ curved transversely on the vertex. Thorax elongate, produced into a neck anteriorly; swollen in front, compressed in the middle, and again widened to the apex, which is obliquely truncated; the truncation with a few deep transverse striæ; the thorax above with short irregular scratches or abbreviated striæ; the legs elongate, rufo-piceous, the tarsi pale. Abdomen: the scale, viewed laterally, is quadrate; above slightly narrowed in front, and truncated before and behind; the first segment rounded at the base and constricted at the apex, the second segment narrowed at the base; the abdomen smooth and shining, with the apical margins of the segments, and the apex, rufo-piceous.

Hab. Borneo (Sarawak).

This species is nearly an exact representative in form, on a reduced scale, of the *P. tarsata*.

12. *PONERA POMPILOIDES*. *P. nigra*, *Pompilum simulans*; thorace elongato-ovato; abdomine elongato nodo conico.

Male. Length 3 lines. Black: antennæ elongate, and finely pubescent. Thorax in front and behind obscurely ferruginous; the wings subhyaline, the nervures pale testaceous, the stigma brown; the apex of the coxæ, and the base of the femora, rufo-piceous; the apical joints of the tarsi pale ferruginous. Abdomen elongate, with a scattered pale downy pubescence; the apical margin of the first segment slightly constricted; the node conical and rufo-piceous.

Hab. Borneo (Sarawak).

13. *PONERA LÆVICEPS*. *P. nigra*; capite elongato lævi nitido; thorace abdomineque lævigatis nitidis; tarsis pallidis ferrugineis.

Worker. Length 3 lines. Black, smooth and shining; a few striæ on the face on each side of the clypeus; the latter triangular, with a central raised longitudinal carina; a longitudinal impressed line runs from the insertion of the antennæ half-way towards the posterior margin of the vertex. Thorax: in front forming a short neck, behind which it is swollen; from thence it is much narrowed and compressed; the apex oblique and transversely rugose; the tarsi pale

rufo-testaceous; the abdomen with a deep strangulation between the first and second segment; the node elevated and rounded above.

Hab. Borneo (Sarawak).

Gen. TYPHLOPONE, *Westw.*

1. TYPHLOPONE LÆVIGATA. *T. castanea nitida lævigata*, capite in medio sulcato.

Worker. Length 4 lines. Chestnut-red: smooth and shining, longitudinally channeled, slightly interrupted, in some examples, near the margin of the vertex; the inner margin, and apex of the mandibles, black. Thorax: a slightly impressed channel in front; the peduncle narrowed and rounded in front; the abdomen and legs rather paler than the head, the margins of the segments slightly constricted.

Worker (minor). About half the size, pale testaceous, and more abruptly truncated on the thorax.

Hab. Borneo (Sarawak).

Gen. TETRAPONERA, *Smith.*

1. *Tetraponera atrata*, *Smith, Ann. & Mag. Nat. Hist.* 2 ser. ix. p. 45 ♀.

Hab. Sarawak.

Subfam. MYRMICIDÆ.

Gen. MYRMICA, *Latr.*

1. MYRMICA LONGIPES. *M. fusco-pallida*, *gracilescens*; capite in colum angustato; thorace compresso, metathorace bispinoso; pedibus elongatis; abdominis nodis duobus globosis.

Worker. Length $2\frac{1}{2}$ lines. Dark brown: the legs testaceous, the tarsi and tips of the antennæ pale testaceous; antennæ longer than the body, very slender, the scape, and also the flagellum, slightly thickened towards their apex; head much wider than the thorax, narrowed behind the eyes, and prolonged into a short neck; the mandibles rufo-testaceous. Thorax: the prothorax elongate, narrowed anteriorly into a short neck, slightly swollen posteriorly; the division between the meso- and meta-thorax deeply impressed; the metathorax with two short acute upright spines. Abdomen ovate, pedunculate, the peduncle formed of two nodes, the first smaller and less elevated than the second, each having a short footstalk.

Hab. Singapore. Borneo.

Notwithstanding the remarkable form of this species, its long slender antennæ and legs, the prolongation of the prothorax into a neck, &c., all of which appear to warrant the formation of a new genus for its reception, yet, not being acquainted with either of the perfect sexes, I do not feel justified in removing it from the genus *Myrmica*.

2. *MYRMICA PELLUCIDA*. *M. fusco-testacea*; *antennis pedibusque pallide testaceis, abdomine pellucido*.

Worker. Length $1\frac{1}{4}$ line. Head and thorax dark fusco-testaceous; antennæ and legs pale testaceous, nearly white; the divisions of the thorax distinctly marked, that between the meso- and meta-thorax rather deeply impressed; the abdomen of a transparent pale testaceous colour; the metathorax not spined.

Hab. Singapore.

Mr. Wallace, on a ticket attached to specimens of this insect, says, "House-ant: transparent abdomen: very active, but not destructive."

3. *MYRMICA VASTATOR*. *M. pallide flavo-testacea, lævis*; *abdomine nitido, apice fuscuscenti*.

Worker. Length $1\frac{1}{4}$ line. The head, thorax, antennæ, legs, and petiole of the abdomen, pale yellow-testaceous; the head oblong quadrate; the eyes small, placed forwards on the side of the head; antennæ clavate, the club formed of three joints; the thorax deeply strangulated between the meso- and meta-thorax; the latter without spines; the abdomen pale at its base, fuscous at its apex.

Hab. Singapore.

Mr. Wallace attaches a ticket to this species, "House-ant: very destructive."

4. *MYRMICA AGILIS*. *M. pallide ferruginea*; *abdomine nigro, basi pallido, lævissimo et politissimo*.

Worker. Length 1 line. Head, antennæ, thorax and legs pale rufo-testaceous; head and thorax very smooth and shining; the flagellum clavate, the club consisting of three joints, the basal joint of the flagellum as long as the three following. Thorax swollen anteriorly, the metathorax with two minute spines. Abdomen ovate, the first node of the peduncle elongate, the second subglobose.

Hab. Malacca.

Gen. *HEPTACONDYLUS*, *Smith*.

Head suborbiculate, wider than the thorax; *eyes* lateral and ovate; *stemmata* placed in a triangle on the vertex; *antennæ* geniculated, filiform, the scape nearly as long as the flagellum, placed forwards on the head at the base of the clypeus; the *flagellum* 6-jointed, the joints clavate, except the apical one, which is cylindrical; the *labial palpi* 3-jointed; the *maxillary palpi* 3-jointed. *Thorax* ovate, gibbous; the *scutellum* very prominent; the *metathorax* armed with two acute spines (in the females), compressed and strangulated (in the workers). The *superior wings* with one marginal and one complete submarginal cell, the submarginal cell receiving the recurrent nervure; the superior angle of the discoidal cell touching the costal nervure. *Abdomen* ovate; the *peduncle* consisting of two nodes.

This is perhaps the most remarkable genus hitherto characterized amongst the *Formicidæ*; it presents one of those anomalies which perplex the naturalist. In the aculeate division of the Hymenoptera, we have felt that there existed in every species certain undeviating and tangible characters, whereby the sex at least might always be discriminated; namely, an additional segment to the abdomen, whereby to distinguish the males, as well as an additional joint to the antennæ; the number of joints in the male being thirteen, and twelve in the female. It is true that one or two exceptions have been recorded: thus, the male of *Crabro vagus*, amongst the fossorial group, has only twelve perceptible joints to the antennæ; and amongst the *Apidæ*, the males of the genus *Cælioxys* have apparently only six segments in the abdomen; in the latter case, however, a seventh segment is concealed, or retracted, within the sixth segment; and in all probability, in the fossorial insect, a joint is concealed within the apex of the scape. In the present genus we find, however, so wide a departure from the normal condition, that it stands almost alone, as an exception to the general rule. In the 'Transactions of the Entomological Society,' vol. ii. of the 2nd series, I established a genus (*Orectognathus*) on characters exhibited in a neuter Ant, the insect having only five joints in the antennæ; but as a neuter cannot be fairly considered the perfect condition of a species, I have thought it possible that the discovery of the other sexes might prove that I had been premature in establishing a genus on the imperfect condition of the species. This cannot be urged in the present instance, as both the female and worker are described, and neither of them has more than six joints in the flagellum.

1. *HEPTACONDYLUS ARACHNOIDES*. *H. capite thoraceque lævissimis nitidis rufo-testaceis ferrugineo-subnebulosis; abdomine obscure rufo-piceo nitido; pedibus elongatis gracilibus pubescentibus.*

Female. Length $4\frac{1}{2}$ lines. Head and thorax rufo-piceous, with dark ferruginous stains on the vertex, scutellum, and metathorax posteriorly; also two longitudinal lines of the same colour on the disk of the mesothorax; the abdomen very dark rufo-piceous, with the three apical segments pale rufo-testaceous; the entire insect very smooth and shining. The mandibles produced, with three black teeth at the apex, and one on the inner margin towards the apex; the antennæ pubescent; the thorax with scattered pale pubescence; the wings flavo-hyaline, the nervures pale testaceous; the legs elongate, with the apex of the joints and the tarsi pale rufo-testaceous; thickly covered with erect pale pubescence. Abdomen covered with pale

pubescence, the nodes of the abdomen dark rufo-piceous, globose, and each having a distinct petiole; the petioles pale rufo-testaceous.

Worker. Length $2\frac{3}{4}$ lines. Dark rufo-fuscous: the antennæ, head beneath, mandibles and lower part of the face pale rufo-testaceous; antennæ slender and elongate; head smooth and shining, not carinated. Thorax shining, the lateral margins traversed by a sharp carina; the metathorax elevated and armed with two acute spines; the legs elongate and slender, the coxæ beneath, the base and apex of the femora and tibiæ, and the tarsi, pale ferruginous. Abdomen smooth and shining, the apex pale ferruginous.

Hab. Borneo (Sarawak).

2. *HEPTACONDYLUS SUBCARINATUS.* *H.* capite thoraceque ferrugineis; abdomine rufo-fusco; capite thoraceque carinulis irregularibus abbreviatis; metathorace spinis duabus acutis armato.

Worker. Length $2\frac{1}{2}$ lines. Head, antennæ, thorax and legs, ferruginous, sometimes pale ferruginous; abdomen fuscous, or rufo-fuscous, the petiole of the basal node pale; head shining, and having a number of irregular delicate carinæ on the front and vertex; in front of the eyes are a number of irregular striæ. Thorax: the sides compressed, widest anteriorly; the superior surface slightly convex, and having a number of longitudinal abbreviated elevated carinæ; the lateral margins traversed by a slight carina; the metathorax with two stout acute spines. Abdomen smooth and shining; the insect sprinkled with a number of pale erect hairs, most numerous on the scape and legs.

Hab. Borneo (Sarawak).

3. *HEPTACONDYLUS CARINATUS.* *H.* obscure fusco-ferrugineus; capite thoraceque carinis irregularibus abbreviatis; metathorace spinis duabus longis armato.

Worker. Length $2\frac{1}{2}$ lines. Dark fusco-ferruginous, closely resembling *H. subcarinatus*, but with thicker antennæ, and the joints shorter, the scape distinctly shorter and not so slender at the base; the head proportionably larger and much more strongly carinated; the thorax roughly carinated, and having longer and stouter spines; in other respects agreeing with *H. subcarinatus*.

Hab. Borneo (Sarawak).

This may possibly be a form of *H. subcarinatus*, but the various differences pointed out appear to characterize a distinct species.

The insect which I am about to describe, although evidently belonging to the *Poneridæ*, is of such a different and remarkable form, to any insect belonging to any of the sections of the genus *Ponera*, or any of the subgenera, that I propose to constitute a new genus for its reception; the abdomen of this singular species

is formed, as it were, of three nodes, each being a little longer and wider than the preceding.

Gen. CERAPACHYS.

Body elongate; *head* narrowed before and behind the eyes; *eyes* ovate, lateral, placed about the middle of the head; *antennæ* short, incrassate; *mandibles* triangular, obsoletely toothed within. *Thorax* oblong-quadrate, strangled in the middle. *Abdomen*: oblong, with a deep strangulation between the first and second segments.

1. CERAPACHYS ANTENNATUS. *C. aterrimus, nitidus*; *antennis* brevibus, crassis; *thorace* oblongo-quadrate; *abdomine* elongato, nodo quadrate; *abdominis* segmentis primo et secundo incisura separatis.

Worker. Length $3\frac{1}{2}$ lines. Jet-black, smooth and shining; *antennæ* one-third longer than the head; the scape short and incrassate, clavate; the flagellum incrassate, the joints short and transverse, except the apical one, which is as long as the four preceding joints; the head depressed on each side in front of the eyes; the *antennæ* inserted at the anterior margin of the head, each at the side of an elevated carina; the mandibles, flagellum and apex of the scape obscurely ferruginous; the posterior margin of the vertex slightly emarginate its entire width, a few scattered minute punctures on the vertex, and a small fossulet in the middle between the eyes. *Thorax*: oblong-quadrate, with a few scattered punctures above, and a few short erect hairs; the tips of the femora and tarsi, and the apical joints of the latter, pale rufo-testaceous; the basal joint of the anterior tarsi bent; the calcaria white. *Abdomen* elongate; the peduncle quadrate, a little narrower than the first segment of the abdomen, which has the sides slightly rounded; a deep strangulation between the first and second segments; the apex obliquely truncated, the margins of the truncation finely denticulated.

Hab. Borneo (Sarawak).

2. CERAPACHYS OCULATUS. *C. pallide fuscus*; *oculis* magnis, atris; *antennis* pedibusque pallide testaceis; *alis* hyalinis; *petiolo* bi-articulato, binodi.

Male. Length $2\frac{1}{2}$ lines. Pale-brown, with dark stains on the sides of the thorax; head oblong-quadrate, the mandibles forming a triangular projection; the eyes large and prominent, situated anteriorly on the sides of the head; the ocelli large, placed in a dark stain on the vertex; the mandibles, *antennæ*, and legs, pale testaceous. The thorax oblong-ovate; the wings hyaline and iridescent, the nervures pale testaceous; the basal node of the petiole narrow at the base, widened to the middle, and again narrowed to the apex, the widest part with a sharp edge, or carina; the second node ovate;

the abdomen subovate, widest towards the extremity, the apex pointed.

It is quite possible that this may prove to be the male of *C. antennatus*, but I do not feel authorized in placing them together.

Gen. CREMATOGASTER, *Lund*.

1. CREMATOGASTER ANTHRACINUS. *C. aterrimus*, lævis et nitidus; tarsis rufo-piceis.

Worker. Length $1\frac{1}{4}$ line. Jet-black, smooth and shining; the face with a few delicate striæ; the extreme base of the scape, and the apex of the flagellum, pale testaceous. Thorax: flattened above, opaque and finely rugose; the metathorax armed on each side with an acute spine; the tarsi pale testaceous, with the claw-joint darker. Abdomen: heart-shaped, smooth, shining and impunctate.

Hab. Singapore.

2. CREMATOGASTER BRUNNEUS. *C. pallide castaneo-rufus*, lævis nitidusque; thorace spinis duabus acutis armato.

Worker. Length 2 lines. Reddish-brown, or castaneous, varying a little in colour; head smooth and shining, wider than the thorax, about the same width as the abdomen, slightly emarginate at the vertex, and more deeply coloured. Thorax: the disk concave and finely striated longitudinally; the metathorax deeply concave and furnished on each side with a stout acute spine; the legs, with the tips of the joints and the tarsi, pale testaceous. Abdomen: heart-shaped, smooth and shining; the first node heart-shaped, flattened above; the second node globose, with two tubercles above.

Worker minor. About one-third smaller, and of a pale testaceous colour; the abdomen darker at the apex.

Hab. Borneo (Sarawak).

3. CREMATOGASTER CEPHALOTES. *C. testaceus*; capite thorace duplo latiore; spinis metathoracis brevibus et acutis.

Worker. Length $1-1\frac{1}{4}$ line. Testaceous; head very large, smooth and shining; the antennæ, clypeus and mandibles, pale testaceous. Thorax: rounded anteriorly, deeply constricted in the middle; in front rugose, with a smooth shining space before the constriction; the metathorax deeply excavated, produced laterally into an acute spine on each side; the tibiæ and tarsi pale testaceous. Abdomen heart-shaped; the basal node flattened anteriorly, with the sides angulated; the second node globose.

Worker minor. Differs in having the head proportionably smaller, and the thorax smooth and shining above.

Hab. Borneo (Sarawak).

4. *CREMATOGASTER OBSCURUS*. *C. testaceus*, lævis et nitidus; thorace strangulato; metathorace bispinoso.

Worker. Length $1\frac{1}{4}$ line. Dull testaceous; the base of the scape and of the flagellum, the clypeus and mandibles, pale; the head smooth and shining. Thorax: rounded in front, with a central longitudinal channel; deeply strangulated in the middle; the metathorax somewhat quadrate, with the posterior lateral angles produced into short spines; the legs with the apex of the joints, and the tarsi, pale testaceous. Abdomen heart-shaped; the basal node of the peduncle flattened in front, the narrow end above.

Hab. Borneo (Sarawak).

5. *CREMATOGASTER INFLATUS*. *C. niger*, lævis et nitidus; parte postica thoracis pallide testacea, inflata.

Worker. Length $2\frac{1}{2}$ lines. Black, smooth and shining, the antennæ dark rufo-piceous; the mandibles striated and ferruginous, their teeth black; eyes small and lateral, placed about the middle of the head. Thorax: the anterior margin rounded; the posterior portion inflated into a yellowish semi-transparent bladder-like swelling, divided in the middle by a deep longitudinal depression; the swollen part not quite so wide as the head; the apical joints of the tarsi rufo-testaceous. Abdomen heart-shaped; the peduncle, base, and the apical margin of the first segment, obscurely rufo-piceous.

Hab. Singapore; Borneo (Sarawak).

This is one of those singular and anomalous species, which, without any particle of information, derived from observation, puzzle and perplex the naturalist; what can possibly be the use of the bladder-like excrescence on the thorax of this insect, it is difficult to imagine; to the touch it is elastic, and apparently forms a receptacle for saccharine fluids. With the aid of a microscope, a small circular orifice can be seen at each of the posterior lateral angles of the swollen part, and small crystallized particles are apparent, not only within the orifice, but scattered over the surface of the inflation; we may, therefore, reasonably suppose that this singular apparatus is for the purpose of elaborating a suitable and necessary aliment for the larvæ of this singular insect.

6. *CREMATOGASTER DIFFORMIS*. *C. niger*; capite thorace multum latiore; thorace dilatato et postice profunde excavato; abdomine cordato.

Worker. Length $2\frac{1}{4}$ lines. Black; head very large, twice as wide as the thorax; the tips of the mandibles, and apical joints of the flagellum, dark ferruginous; the head smooth and shining; the eyes small, placed laterally about the middle of the head. Thorax: the anterior margin rounded, the sides parallel behind; the metathorax greatly dilated at the sides and above, and with a deep excavation behind;

the legs stout, with their joints and the tarsi ferruginous. Abdomen heart-shaped, with the base, in some examples, slightly ferruginous.

Worker minor. Differs only in being one-third smaller.

Hab. Singapore; Borneo (Sarawak).

This species resembles the *C. inflatus* in form; but the swollen portion of the thorax is of a solid consistency; it forms, however, a similar laboratory of saccharine matter; the orifice from which it exudes is not exactly at the posterior angles, but a little way beneath; in some specimens, masses of crystallized particles can be seen beneath the orifice; of this species, both large and small workers have been examined, and the same apparatus is found on them both.

Gen. ATTA, Latr.

1. ATTA PENETRANS. *A. capite thoraceque nigris; abdomine obscure rufo-piceo; alis subhyalinis; capite thoraceque longitudinaliter striatis.*

Female. Length 4 lines. Black and shining; head longitudinally finely striated; the mouth, clypeus and antennæ, ferruginous. Thorax: elongate-ovate, the prothorax anteriorly and the legs, ferruginous; the thorax above with oblong punctures which run into striæ; an impunctate line in the middle of the mesothorax anteriorly; the metathorax truncated, the truncation smooth and shining; wings subhyaline, with a fuscous line along the costal nervure; the apical margins of the wing with a fringe of very fine white hairs. Abdomen: elongate-ovate, dark rufo-piceous, the apical margins of the segments brighter; the nodes of the peduncle globose and punctured.

Hab. Borneo (Sarawak).

2. ATTA CINGULATA. *A. ferruginea; pedibus abdomineque pallide ferrugineis; capite maximo, thorace triplo latiore.*

Worker major. Length $1\frac{3}{4}$ line. Head very large, ferruginous, the antennæ paler; eyes very small, placed at the sides of the head a little before the middle. Thorax: pale ferruginous, very convex or globose anteriorly, much narrower behind, with two short acute spines on the metathorax; legs pale rufo-testaceous. Abdomen: ovate, with the base truncated, with a fuscous ring in the middle; the nodes of the peduncle globose.

Worker minor. About 1 line in length. The head much smaller and more elongate; in colour, resembling the larger worker, and equally smooth and shining; the abdomen with a fuscous ring in the middle.

Hab. Borneo (Sarawak).

Gen. PHYSATTA.

Head small; *eyes* of moderate size, placed a little before the middle; *ocelli* in a triangle on the vertex; *mandibles* stout and denticulate

at the apex; *antennæ* short, not so long as the head and thorax; the *scape* nearly as long as the flagellum, slightly thickened at the apex; *flagellum* subclavate, 6-jointed, the first joint shorter than the second; the third, fourth and fifth about the same length as the first, the apical joint the length of the two basal ones. *Maxillary palpi* 3-jointed, the basal and apical joints of about equal length, the intermediate joint twice the length of the apical joint, the latter obliquely truncate at the apex. *Labial palpi* 3-jointed, the two basal joints clavate, the apical one fusiform. *Thorax* subglobose; *anterior wings* with one marginal and two submarginal cells, the first submarginal cell about the length of the stigma, the second extending to the apex of the wing; with one sub-triangular discoidal cell; the *tibiæ* armed with a single spur at the apex. *Abdomen* globose, pedunculated, the peduncle formed of two nodes.

This genus in one of its most prominent characters agrees with the genus *Heptacondylus*, both having seven-jointed antennæ: their relative proportions are, however, very different, as well as that of the joints of the flagellum; the wings have also a different neurulation; this latter character will, I am inclined to believe, prove eventually that by which the generic divisions of the Hymenoptera must be regulated; even at present, with our meagre and imperfect knowledge of the species, it does, if strictly adhered to, bring together assemblages of species, allied alike in habit and structure; when taken in connexion with the structure of the mandibles and legs, indicative of habit, it becomes perhaps the most safe and available character hitherto adopted for their generic subdivision; the greatest help to science I think is its simplification.

1. *PHYSATTA DROMEDARIUS*. *P. capite thoraceque ferrugineis; alis abdomineque nigris.*

Female. Length $6\frac{1}{2}$ lines. The head, thorax, legs and petiole of the abdomen ferruginous; the mandibles with four or five black teeth; the head and thorax longitudinally striated and clothed, as well as the legs, with erect thin fulvous pubescence; the intermediate and posterior legs dark rufo-piceous; wings dark fuscous, slightly iridescent; the metathorax armed with two short stout spines at its base, the truncated portion transversely striated. Abdomen black, covered with a short erect fuscous pubescence; the nodes of the petiole subglobose, the first attached to the thorax by a short stout petiole.

Hab. Borneo (Sarawak).

Gen. TYPHLATTA.

Mandibles triangular; *eyes* obsolete; *flagellum* 9-jointed; petiole of the abdomen formed of 2 nodes.

The above characters are those of the worker of the species; probably an examination of the other sexes would present other very distinctive generic characters, particularly in the neuration of the wings: the palpi I have not examined.

1. TYPHLATTA LÆVICEPS. *T. niger*, nitidus; capite, thorace antice et abdomine glaberrimis; antennis tarsisque rufo-piceis.

Worker. Length 2 lines. Black; the head glassy-smooth and shining; ovate, with the posterior margin of the vertex truncate; in some examples, an indistinct castaneous spot at the sides of the head, in the usual situation of the eyes; the antennæ ferruginous. Thorax elongate, compressed at the sides; very smooth and shining anteriorly, with a delicate striation in the middle, the metathorax being finely rugulose; the tarsi rufo-piceous. Abdomen: ovate, very smooth and shining; the nodes subglobose, the basal one being the smallest.

Hab. Borneo (Sarawak).

Subfam. CRYPTOCERIDÆ.

Gen. ECHINOPLA.

Head transverse; *eyes* small, placed laterally, high on the head; antennæ 12-jointed, inserted forwards on the head, wide apart; the *labial palpi* 4-jointed, the three basal ones of about equal length, clavate; the apical joint as long as the two preceding joints united; the *maxillary palpi* 5-jointed, elongate, the three apical joints long and slender, the two basal ones much shorter and stouter; *mandibles* short, stout, and of equal width throughout, armed with five stout teeth. *Thorax* oblong-quadrate; legs of moderate length; tarsi 5-jointed; each tibia armed with a single spine at the apex. *Abdomen* globose; peduncle formed of a single node; the first segment very large, concealing the other segments beneath it.

1. ECHINOPLA MELANARCTOS. *E. nigra*, hispida; oculis extantibus; abdominis squama in utroque latere spina longa acuta horizontali; abdomine globoso.

Worker. Length 3 lines. Black; the head, thorax and abdomen, covered with short blunt spines, or pedestals, each having a long hair at its summit; the palpi pale testaceous; the antennæ inserted under thin elevated curved plates on the anterior part of the face, the face with a rugose striation; the head smooth beneath, shining and concave; the eyes very prominent and globose. Thorax rugose; the legs slightly pubescent, the calcaria pale testaceous. (Fig. and details, Plate I.)

Hab. Singapore.

2. *ECHINOPLA PALLIPES*. *E. nigra*, hispida; oculis prominentibus; abdomine globoso; squama in utroque latere spina horizontali; pedibus pallide testaceis.

Worker. Length $2\frac{1}{2}$ lines. Black, rugose; the abdomen vermiculate, interspersed with slight elevations placed in great regularity over the entire upper surface, each elevation terminating in a hair; the scape and the mandibles ferruginous; the eyes very prominent; the palpi and legs pale testaceous, with the tarsi rufo-piceous; the peduncle transverse, produced on each side into a short horizontal spine; the abdomen rufo-piceous.

Hab. Borneo (Sarawak).

It is very difficult to describe the sculpturing of this insect; on the head it is strongest; the species strongly resembles *E. melanarcos*, but the elevations are shorter, as well as the hairs at their apex.

3. *ECHINOPLA STRIATA*. *E. nigra*; capite, thorace et abdomine longitudinaliter striatis; thorace oblongo, subquadrato; pedunculo transverso.

Worker. Length 3 lines. Black; the head, thorax and abdomen finely striated longitudinally; the head with an obscure blue tinge; the palpi pale rufo-testaceous. Thorax: oblong, the margins denticulate, the anterior margin rounded, the lateral margins narrowed to the middle, and again widened posteriorly; above slightly arched; the division of the pro- and meso-thorax distinctly marked by a suture; that of the meso- and meta-thorax by a deep strangulation; the peduncle of the abdomen incrassate, transverse, and armed on each side by a stout spine. The entire insect thinly sprinkled with erect black hairs.

Hab. Malacca.

Of this species I have only seen two individuals: I place it in this genus with some hesitation; but the antennæ are similar; the thorax and scale of the abdomen of the same form; the legs also are short, as in *Echinopla*: the principal difference being, that the eyes are less prominent; it is altogether a very curious and remarkable species.

Gen. CATAULACUS, *Smith*.

1. *CATAULACUS INSULARIS*. *C. niger*; vertice spinis duabus postice armato; alis flavo-hyalinis; metathorace bispinoso; abdomine cordato.

Male. Length 3 lines. Black: head and thorax rugose; the antennæ, the eyes, the mandibles, the tibiæ and the tarsi, ferruginous; the palpi pale; the eyes very large and prominent; the clypeus produced and broadly truncate in front; the hinder margin of the vertex straight, margined, and having the posterior lateral angles produced into stout acute spines; the outer margins of the spines serrated; beneath are smaller spines at the lower lateral angles; the wings sub-

hyaline and yellowish; the nervures scarcely discernible; the hinder margin of the metathorax slightly emarginate its entire width, with an acute spine at each of the lateral angles. The nodes of the abdomen rugose; the first node oblong-quadrate; the second nearly quadrate; the abdomen reddish at the base, and, as well as the nodes, thinly sprinkled with erect whitish hairs.

Hab. Borneo (Sarawak).

2. *CATAULACUS HORRIDUS*. *C. niger*; capitis angulis posticis spinosis; marginibus capitis crenulatis; thorace aspere sculpto, spinis duabus acutis elongatis postice armato; abdomine ovato, basi striato.

Worker. Length 3 lines. Black; the antennæ short, thick and clavate; the apex rufo-testaceous; head reticulated, produced before the eyes and widely truncated, the lateral angles of the truncation rounded; the lateral margins with a short spine before the eyes; the vertex with the posterior margin emarginate its entire width, forming at the lateral angles large acute spines. Thorax: ruggedly sculptured on the disk, narrowed to the apex of the mesothorax, which is separated from the hinder portion by a deep transverse incision; produced posteriorly at the angles into long, stout, acute spines; the nodes of the abdomen rugose; abdomen rounded, emarginate and striated at the base; the entire insect sprinkled with short erect white setæ.

Hab. Borneo (Sarawak). Malacca.

3. *CATAULACUS RETICULATUS*. *C. niger*, delicatule reticulatus, præsertim in abdomine; marginibus capitis thoracisque lateribus crenulatis; thorace spinis duabus validis postice armato.

Worker. Length $1\frac{1}{2}$ –2 lines. Black; head and thorax reticulated; antennæ short, thick and clavate; the clypeus widely emarginate; the sides of the head produced into a sharp angle in front of the eyes; behind the eyes the margin is crenulated, the posterior lateral angles acute. Thorax: the anterior margin slightly rounded; the sides rounded and narrow to the metathorax, with a short tooth anteriorly and posteriorly; the thorax produced behind into two elongate, lateral, acute spines; the anterior tibiæ and tarsi and the apical joints of the intermediate and posterior tarsi, ferruginous. Abdomen: oval, margined, emarginate in front and very delicately reticulate.

Var. a. minor. The scape, apical joint of the flagellum, the margin of the head before the eyes and the legs, ferruginous.

Hab. Borneo (Sarawak).

This species somewhat resembles the *C. Taprobanæ*, but is different in sculpture and form.

Gen. MERANOPLUS, *Smith*.

1. *MERANOPLUS CASTANEUS*. *M. castaneo-rufus*; capite thoraceque subrugosis; metathorace bispinoso; pedunculi nodo secundo spina postice armato.

Female. Length $3\frac{1}{2}$ lines. Chestnut-red; the flagellum obscurely red; the teeth of the mandibles and the eyes black; the head and thorax above longitudinally strigose, the head more finely so, both sparingly covered with scattered erect fine pale hairs; the scutellum rugose; the metathorax with a stout acute short spine on each side at its base; the central portion of the truncation shining and finely striated longitudinally; the legs with scattered pale hairs, the femora dark red towards their base. The nodes of the peduncle of the abdomen rugose; the first, viewed laterally, wedge-shaped; the second subquadrate, the posterior margin produced into an acute spine; the second node is produced into an angular tooth or process at its base, and both are sprinkled with long erect hairs. Abdomen ovate, finely punctured, and thinly sprinkled with long pale hairs, most thickly covered towards the apex.

Hab. Borneo (Sarawak).

2. *MERANOPLUS CORDATUS.* *M. castaneo-rufus*; thorace quadrispinoso; abdomine cordato.

Worker. Length 2 lines. Chestnut-red; the head and thorax palest; the head very delicately reticulated; the eyes small and black, placed at the sides of the head backwards near the vertex; the clypeus widely truncate in front. Thorax: punctured, the anterior margin somewhat transverse, slightly produced and rounded in the middle, the lateral angles acute; the sides rounded and narrowed to the base of the metathorax; the posterior margin transverse; at the angles are long acute spines, with a second shorter spine before them; the truncated vertical portion of the metathorax has on each side about the middle of the lateral margin a short acute spine. Abdomen: the first node, viewed laterally, is wedge-shaped, the second somewhat quadrate, its posterior margin above produced into an acute spine; the upper margin of the first node, truncate; the abdomen heart-shaped, acute at the apex; the entire insect sprinkled with erect pale hairs.

Hab. Borneo (Sarawak).

This is probably the worker of *M. castaneus*.

3. *MERANOPLUS MUCRONATUS.* *M. capite*, thorace pedibusque ferrugineis; abdomine nigro; thorace quadrato; angulis singulis spina acuta armatis.

Worker. Length $2\frac{1}{2}$ lines. The head and thorax ferruginous; the abdomen black; the head coarsely rugose, narrowed before the eyes and widely emarginate in front; the eyes prominent, behind them the margins are widened slightly to half the distance between them and the posterior angles of the head, towards which the margins are narrowed; the head sprinkled with a few long erect reddish hairs. Thorax: quadrate, rugose, with the angles produced into four very long, stout, acute spines; the hinder margin with two short blunt teeth or spines in the middle, with two minute ones beyond them placed some-

what obliquely; the metathorax with two long, rather slender, very acute spines; the thorax and legs thinly sprinkled with very long ferruginous hairs; the abdomen sprinkled with long erect ferruginous hairs, the nodes rugose.

Var. *a*. The femora rufo-fuscous.

Hab. Malacca (Mount Ophir).

To this species Mr. Wallace attached a ticket, upon which he had written "House Ant:" but I have not obtained any further information.

Fam. MUTILLIDÆ.

Gen. MUTILLA, *Linn.*

1. *Mutilla blanda*, *Smith, Cat. Hym.* pt. iii. p. 32.

Hab. Malacca (Mount Ophir). India.

2. *Mutilla repræsentans*, *Smith, Cat. Hym.* iii. p. 35.

Hab. Borneo (Sarawak). Malacca. India.

3. *MUTILLA DEIDAMIA*. *M. nigra*; scapo, mandibulis, thorace, pedibus abdominisque segmento basali rubris.

Female. Length 3-4 lines. Head black; the scape, palpi and mandibles, ferruginous, tips of the latter black; the flagellum ferruginous towards the apex beneath. Thorax: elongate-quadrate, slightly widened behind, above rugose, the lateral margins crenulated; sprinkled with reddish-brown pubescence; the legs ferruginous, thinly sprinkled with a mixture of reddish and of glittering white hairs. Abdomen: black, the basal segment red; three ovate spots of silvery white pubescence placed transversely towards the base of the second segment, and a broad fascia of the same at the base of the third segment; at the base, apex and beneath, a scattered glittering white pubescence.

Hab. Borneo (Sarawak).

4. *MUTILLA URANIA*. *M. capite thoraceque sanguineis*; abdomine nigro, basi segmenti secundi macula ovata, fasciæque segmenti tertii, flavescenti-albis.

Female. Length $6\frac{1}{2}$ lines. Head and thorax blood-red and coarsely rugose; the mandibles and antennæ black; the flagellum obscurely red beneath. Thorax: the legs black and covered with glittering yellowish-white pubescence. Abdomen: longitudinally rugose, a reversed heart-shaped spot at the base of the second segment, and the third covered with yellowish-white pubescence; a triangular black spot at the base of the third segment in the middle; beneath, the segments are fringed with long pale hairs; the apical margins of the segments of the abdomen with a sooty-black pubescence.

Male. Length 5-5½ lines. This sex has the head nearly, or quite black;

the eyes slightly reniform. Thorax red; the wings dark brown with a purple iridescence, pale towards their base. Abdomen black, smooth and shining, much narrowed at the base, and subpetiolate; the second and two following segments fringed with long white pubescence; the three apical segments fringed with black.

Hab. Borneo (Sarawak).

5. *MUTILLA SUSPICIOSA*. *M. nigra*, pubescens; alis fuscis; abdominis segmentis secundo tertioque rubris.

Male. Length 4-7 lines. Black; the eyes slightly emarginate; the head covered with a thin silvery-white pubescence, most sparing on the vertex, which is shining and coarsely punctured. Thorax covered with a silvery pubescence, densely so on the metathorax; the disk of the mesothorax shining, with elongate punctures which run into striæ; in the middle are three elongate carinæ; the tegulæ large and shining-black; the wings dark fuscous, with a purple iridescence. Abdomen finely punctured; the apical margin of the basal segment, and the second and third segments, red; sprinkled with long glittering silvery-white hairs.

Hab. Borneo (Sarawak).

This species very closely resembles the *M. fuscopennis*: but I think it is sufficiently distinct.

6. *MUTILLA GRACILLIMA*. *M. capite abdomineque nigris*; thorace rubro; alis obscure fuscis.

Male. Length 4 lines. Head and abdomen black, the thorax bright red; head shining, with longitudinal furrows, and a deep channel before the anterior stemma; the scape, and first joint of the flagellum, ferruginous; the pro- and meso-thorax rugose; the metathorax with large separated punctures; the wings fuscous, subhyaline at their base; the anterior tibiæ and femora, and the intermediate femora, ferruginous; the calcaria white. Abdomen: the two basal segments with purple and blue tints; the apical margin of the second segment, and the third segment, with a broad band of silvery-white pubescence; the following segments fringed with black pubescence.

Hab. Borneo (Sarawak).

7. *MUTILLA FAMILIARIS*. *M. capite abdomineque nigris*; thorace rubro; abdominis basi subito truncato; abdominis segmenti secundi basi macula, tertii fascia lata argenteo-pubescentibus.

Female. Length $4\frac{3}{4}$ lines. Head and abdomen black, the former rugose; the flagellum ferruginous beneath. Thorax ferruginous and oblong-quadrate; the disk rugose; the margins crenulated. Abdomen with elongate confluent punctures; the basal segment abruptly truncated; the second segment with a small ovate spot in the middle of its base, and the third segment covered with short silvery-white pubescence;

beneath, the margins of the segments are fringed with long white pubescence.

Hab. Singapore.

Although this species bears a very close resemblance to several which have been described, it is very distinct, and may be readily distinguished by the abrupt truncation of the basal abdominal segment.

8. *MUTILLA CALLIOPE*. *M. capite nigro; thorace rubro; abdomine cyaneo, fascia lata argenteo-pubescenti decorato.*

Female. Length 3-3½ lines. Head black, punctured, the punctures running into longitudinal striæ; the base of the scape, and the tips of the mandibles, ferruginous. Thorax bright ferruginous, elongate-quadrate and coarsely rugose; the posterior angles rounded; the anterior tibiæ and tarsi, and the base of the intermediate and posterior femora, ferruginous; the legs with a scattered silvery pubescence, that on the thorax above, ferruginous; the thorax slightly carinated at the sides. Abdomen dark blue; the apical margin of the second segment, and the base of the third, with united fasciæ of bright silvery pubescence; the sides and apex of the abdomen with scattered silvery hairs.

Male. Resembles the female in colour, but has the legs entirely black; with the apical margin of the second abdominal segment, pale testaceous; the wings dark brown; the eyes large and ovate.

Hab. Borneo (Sarawak).

9. *MUTILLA PROSERPINA*. *M. capite abdomineque nigris; thorace pedibusque rubris; abdominis segmenti secundi basi maculis duabus ovatis, tertii fasciæque argenteo-pubescentibus.*

Female. Length 2-3 lines. Head black; the scape, mandibles and palpi, ferruginous. Thorax ferruginous, oblong, rounded in front and behind; rather finely rugose, sprinkled with reddish-brown pubescence, the margins crenulated; the legs ferruginous, with the knees and tarsi slightly fuscous. Abdomen: the extreme base ferruginous; the second segment with two ovate spots, and the third with a fascia of silvery-white pubescence; beneath, and towards the apex above, thinly sprinkled with long glittering white hairs.

Hab. Borneo (Sarawak).

10. *MUTILLA PANDORA*. *M. capite abdomineque nigris; thorace rubro; abdominis segmento secundo maculis tribus ovatis, tertio fascia argenteo-pubescenti ornatis.*

Female. Length 5 lines. Head black; the scape, flagellum beneath, except the basal segment, the palpi, and basal half of the mandibles, ferruginous; the head coarsely and closely punctured, with scattered erect black hairs above, and with silvery white ones beneath. Thorax and legs bright ferruginous, the former oblong-quadrate, coarsely rugose, the lateral margins crenulated; sprinkled with reddish

pubescence. Abdomen black, the base ferruginous; covered with short black pubescence; three ovate spots at the base of the second segment, a narrow fascia on its apical margin, and a broad one on that of the following segment, of silvery-white pubescence; beneath, shining and punctured, the margins of the segments rufo-piceous and fringed with glittering pale hairs.

Hab. Borneo (Sarawak).

11. *MUTILLA SIBYLLA*. *M. capite abdomineque nigris; thorace rubro; abdominis segmenti secundi basi maculis duabus ovatis, fasciaque segmenti tertii albo-pubescentibus.*

Female. Length 4-6 lines. Black; the thorax red; a tubercle at the insertion of each antenna, and the middle of the mandibles, ferruginous; the vertex with scattered long erect reddish brown hairs; on the clypeus, mouth and cheeks are some long glittering silvery-white hairs; the palpi elongate. Thorax: oblong-quadrate, the anterior margin slightly rounded; the legs with scattered glittering white hairs; the legs black, with the tarsi obscurely rufo-piceous; the calcaria pale testaceous. Abdomen: two small ovate spots at the base of the second segment, and a broad fascia on the apical margin of the third, of dense, short, silvery-white pubescence; beneath, the segments shining, and the second with scattered large deep punctures; the apex of the abdomen with long white pubescence.

Hab. Borneo (Sarawak).

12. *MUTILLA CASSIOPE*. *M. capite abdomineque nigris; thorace pedibusque rubris; tibiis tarsisque fuscis; abdominis basi truncata.*

Female. Length 3 lines. Head and abdomen black, the former closely and strongly punctured; the mandibles, palpi and antennæ beneath, ferruginous; the scape rufo-piceous. Thorax ferruginous; the anterior margin transverse; slightly and evenly narrowed to the apex of the metathorax; the lateral margins crenulated; the disc coarsely rugose; the coxæ and femora ferruginous; the tibiæ and tarsi fuscous. Abdomen: the base abruptly truncate; covered with elongate punctures; the apical margin of the third segment with a fascia of snow-white pubescence; sprinkled over with long silvery-white hairs.

Hab. Borneo (Sarawak).

13. *MUTILLA DARDANUS*. *M. capite abdomineque nigris; thorace pedeque antico rubris; alis fuscis; abdominis segmentis primo, secundo tertioque pube alba fasciatis.*

Male. Length 6 lines. Head and abdomen black; the thorax red; the eyes emarginate; the antennæ incrassate at the base, tapering to the apex; a deep longitudinal furrow runs from the insertion of the antennæ to the posterior margin of the vertex, on each side of which is a similar furrow which terminates before the insertion of the antennæ; the ocelli distinct on the vertex. Thorax: the anterior legs

ferruginous; wings brown, and iridescent. Abdomen shining, punctured, and having purple and blue tints in different lights; a narrow fascia on the apical margin of the first segment and a broader one on the second and third, of snow-white short dense pubescence; the margins of the apical segments fringed with long black pubescence.

Hab. Borneo (Sarawak).

14. *MUTILLA UNIMACULATA*. *M.* capite abdomineque nigris; thorace ferrugineo; abdominis segmenti secundi basi macula ovata, segmento tertio fascia lata alba pubescente.

Female. Length 6 lines. Black; the thorax ferruginous, and coarsely rugose. Head sprinkled with dark brown hairs, eyes large and ovate; the clypeus and scape with whitish hairs. Thorax oblong-quadrate, slightly narrowed posteriorly; the disk with short reddish-brown pubescence at the sides; beneath and on the legs it is of a glittering silvery-white; the metathorax with long thin pale pubescence; an ovate spot at the base of the second segment, and the third segment clothed with dense short white pubescence, in the middle at its base, a triangular black shape; beneath, the apical margins of the second, third and fourth segments with white marginal pubescent fasciæ.

Hab. Borneo (Sarawak).

Gen. MYRMOSIDA, *Smith*.

Head subquadrate; *stemmata* in a triangle on the vertex; *eyes* large, round and lateral; *antennæ* subfiliform, inserted at the base of the clypeus, not closely approximating; the *clypeus* triangular; *mandibles* triangular. *Thorax*: longitudinally quadrangular, the sides slightly rounded; the posterior margin of the prothorax curving backwards to the origin of the wings; the *tegulæ* small; the superior wings with one marginal and two submarginal cells; the first submarginal receiving the first recurrent nervure. *Abdomen*: ovate, the two basal segments forming distinct nodes, the first subquadrate, the second node widening towards the apex and again narrowing at one fourth from the apex.

The insect from which the above characters are drawn being a male, there can be little doubt that when the other sex is discovered the generic characters will require a complete revision; in the venuration of the wings this genus very closely approaches that of *Mutilla*, the males of which have the third submarginal cell frequently obliterated, and the form of the abdomen often very eccentric; the form of the eyes also varies, from being deeply emarginate or reniform, to being round and very prominent. The situation of the present genus I think must be next to *Myrmosa*:

we should certainly expect to find the female apterous, and the genus correctly placed in the family *Mutillidæ*.

1. MYRMOSIDA PARADOXA. *M. nigra*; capite thoraceque rude rugosis; alis subhyalinis; abdomine basi binodoso.

Male. Length 4 lines. Black; head nearly as wide as the thorax, coarsely rugose, across the face between the eyes are some deep transverse grooves; the face with two longitudinal carinæ, outside of which the antennæ are inserted; the scape short and thick, the flagellum nearly of equal thickness throughout, pointed at the apex, the extreme tip pale testaceous; mandibles ferruginous at their apex; the palpi pale testaceous. Thorax: coarsely rugose; wings subhyaline, the nervures ferruginous, stigma dark brown; the anterior tarsi ferruginous, with a dense glittering pale pubescence beneath; the base of the femora, knees and apex of the tibiæ and apical joints of the tarsi, ferruginous; the calcaria pale rufo-testaceous. The abdominal nodes coarsely longitudinally rugose; the abdomen smooth and shining, the second and following segments punctured, with their apical margins impunctate.

Hab. Singapore.

Only one specimen of this very singular insect has been captured, and is in the collection of W. W. Saunders, Esq.

Tribe FOSSORES, *Latr.*

Fam. SCOLIADÆ.

Gen. SCOLIA, *Fabr.*

Div. 1. *The anterior wings with two submarginal cells and one recurrent nervure.*

1. *Scolia erratica*, *Smith, Cat. Hym. pt. 3. p. 88.*

Scolia verticalis, *Burm. Abh. Nat. Ges. Halle, p. 37.*

Hab. Sarawak.

Div. 2. *The anterior wings with two submarginal cells and two recurrent nervures.*

2. *Scolia aureicollis*, *St. Farg. Hym. iii. 499.*

Hab. Singapore.

3. *Scolia grossa*, *Burm. Abh. Nat. Ges. Halle, i. p. 23.*

Hab. Sarawak.

This is *Tiphia grossa* of the 'Systema Piezatorum' of Fabricius.

4. *Scolia Iris*, *St. Farg. Hym. iii. p. 547.*

Hab. Malacca (Mount Ophir). Java. Sumatra. China (Shanghai).

Div. 3. *The anterior wings with three submarginal cells and one recurrent nervure.*

5. *Scolia patricialis*, *Burm. Abh. Nat. Ges. Halle*, i. 19.

Hab. Malacca. Sumatra.

6. *Scolia rubiginosa*, *Fabr. Syst. Piez.* p. 241.

Hab. Malacca. Java.

7. *SCOLIA CINCTA*, *Smith.* *S. nigra*; vertice flavo; alis nigris; abdomine fascia pubescente ferruginea.

Black; the head, from the insertion of the antennæ to the hinder margin of the vertex, yellow, glossy smooth. The thorax closely and strongly punctured; a smooth shining space in the middle of the disk, the scutellum also shining, with a few large scattered punctures; the wings brown-black with a splendid violet iridescence, rather paler towards their base with the nervures ferruginous; the metathorax truncated and slightly concave. Abdomen: closely but more finely punctured than the thorax, with a shining nearly impunctate space in the middle of each segment; the posterior margin of the second segment with a fringe of bright ferruginous pubescence, also a little ferruginous pubescence at the tip of the apical segment.

Female. *Hab.* Borneo (Sarawak). Length 13 lines.

This species is most closely allied to *S. patricialis*, but has the sculpture of the thorax very different and has no yellow markings on the scutellum, base and third segment of the abdomen, which distinguishes that species.

8. *Scolia procera*, *Fabr. Syst. Piez.* p. 241.

Hab. Sarawak. Java.

Nearly all the specimens of this fine species have been brought from Java. I believe it has occurred in India, but Borneo is probably the extent of its geographical range to the south.

9. *SCOLIA OPALINA*, *Smith.* *S. atra*; alis nigris; metathorace abdomineque opalino pulcherrime lavatis.

Black, with splendid prismatic colours reflected in certain lights; the head smooth and shining, and with a few scattered punctures; the scape of the antennæ smooth and shining, the flagellum opaque. Thorax: above shining, somewhat distantly but evenly punctured, a smooth space on the disk of the mesothorax; wings brown-black with a splendid violet iridescence. The abdomen smooth and shining, the sides and the two apical segments rather closely punctured, in the middle of the three basal segments only a few fine scattered punctures; beneath strongly but not very closely punctured. *Female.* Length 12 lines.

The male resembles the female, but is, if possible, more beautiful in the splendour of its metallic lustre. Length 9 lines.

Hab. Sarawak.

10. *SCOLIA SPECIOSA*. *S. atra*; fronte, macula post-oculari, thoracis maculis duabus frontalibus, metathorace supra, fascia annuli tertii abdominis interrupta, flavis.

Black and shining; the head impunctate; a large bell-shaped macula on the face extending from the margin of the vertex to the insertion of the antennæ, a black spot nearly in the centre of the space enclosing the ocelli; the eyes and a lunate spot behind them yellow. Thorax: a broad yellow stripe on each side in front curving over each tegula, having a straight oblique termination within; the metathorax yellow at the base as far as the margin of the truncation; the whole of the disk of the thorax impunctate, or with only a few widely scattered punctures on the sides of the mesothorax and scutellum: from the anterior angles of the latter a deeply impressed smooth line passes forward, terminating opposite to the anterior margin of the tegulæ; the post-scutellum punctured and the thorax on each side of the scutellum opaque; the wings brown-black, with a splendid violet and blue iridescence, the nervures black. Abdomen: closely punctured, the first segment with a central smooth space at its base; the second segment smooth and shining, except at the sides; the third smooth at the base with a broad transverse yellow stripe slightly interrupted in the middle; beneath, the segments smooth and shining in the middle, and with a few scattered punctures.

Female. Length 15 lines. *Hab.* Sarawak.

This is one of the most beautiful species of the genus, and has not hitherto been captured in any other locality than Borneo.

Gen. *TIPHIA*, *Fabr.*

1. *TIPHIA FUMIPENNIS*. *T. nitida, atra, punctata*; alis anticis fumatis purpureo-iridescentibus.

Female. Length 8 lines. Black, shining, pubescent, with scattered punctures; the mandibles ferruginous, fringed beneath with bright fulvous hairs; the head strongly punctured. The prothorax strongly punctured, its posterior margin impunctate, smooth and shining; the mesothorax strongly punctured; the tegulæ smooth and shining; the superior surface of the metathorax with three central longitudinal elevated lines, the spaces between them rugose; the verge of the truncation and the lateral margins bordered by an elevated line; the surface has a shining silky appearance and is very delicately transversely reticulated; the anterior wings smoky, with a bright purple iridescence; the posterior pair faintly coloured towards their apex; the legs with a glittering white pubescence. Abdomen: smooth and shining; the three apical segments punctured; the apex rufopiceous.

Hab. Borneo (Sarawak).

2. *TIPHIA STIGMA*. *T. nitida*, atra, punctata; alis subhyalinis, stigmatate atro.

Male. Length 5 lines. Black, punctured and shining; the clypeus with shining white pubescence; its anterior margin notched; tips of the mandibles ferruginous; the flagellum fuscous beneath; the metathorax with three or four longitudinal elevated lines; wings subhyaline, faintly smoky towards their apex; the nervures pale testaceous; the stigma large and black; the tibiæ and tarsi with glittering white pubescence; the calcaria pale testaceous. Abdomen: the first segment much narrower than the second, and subglobose; the following segments thinly covered with sooty-black pubescence.

Hab. Borneo (Sarawak).

3. *TIPHIA FLAVIPENNIS*. *T. nitida*, atra, sparse griseo-pubescent; alis flavescentibus.

Female. Length 4-5 lines. Black, with scattered punctures: the mandibles ferruginous; the palpi pale testaceous; the flagellum obscurely ferruginous beneath; the scape fringed beneath with long glittering pale hairs; the superior surface of the metathorax, with three longitudinal elevated lines, extending to the verge of the truncation; the outer margin of the tegulæ piceous; wings yellowish, their apical margins slightly clouded; stigma small, and as well as the nervures, pale testaceous; the legs with a glittering white pubescence; the calcaria pale testaceous. Abdomen: smooth and shining, with scattered delicate punctures; the margins of the segments thinly fringed with long pale hairs; the apex rufo-piceous.

Hab. Borneo (Sarawak).

Gen. MYZINE, Latr.

1. *MYZINE TRICOLOR*. *M. punctata*, nitida; capite rubro; thorace nigro; abdomine metallico-cyaneo.

Female. Length 10 lines. Head red; the thorax black; the abdomen metallic-blue; the face closely and coarsely punctured; the vertex shining, the punctures finer and more distant; a deep punctured fovea behind the ocelli; the scape in front, and the mandibles ferruginous, the latter black at their tips. Thorax coarsely punctured; the wings brown at their apex, becoming by degrees hyaline at their base, the anterior pair with a bright violet iridescence; the nervures black; the legs strongly spinose, with scattered white pubescence. The abdomen partaking of purple and violet tints in different lights.

Hab. Borneo (Sarawak).

Fam. POMPILIDÆ.

Gen. POMPILUS, Fabr.

This extensive genus of insects, some species of which inhabit

every known country of the world, contains individuals exhibiting great variety, not only in their colouring, but also in their structure and form; one group, which contains the most highly coloured and elegantly formed species, have their tibiæ and tarsi destitute, or nearly so, of spines; another, on the contrary, have their tibiæ more or less spined, the anterior tarsi spined, and frequently pectinated; a third group have the intermediate and posterior tibiæ furnished with a double row of teeth, or serrations, the tarsi being strongly spined. All the above striking differences are, however, linked together by imperceptible modifications; these will always be found, when an extensive collection of these insects, from various countries, are brought together and carefully examined. The differences alluded to are undoubtedly of high value, when investigating the œconomy and habit of the species; thus we find, that the *P. punctum* of Europe, which belongs to the subgenus *Agenia*, in which the species are destitute of spines on the tibiæ, is not a burrowing insect, but constructs tubular cells of mud; *P. rufipes*, on the contrary, is eminently fossorial and has serrated posterior tibiæ, and has also the anterior tarsi furnished with long cilia. In the present paper, I adopt as subgenera, the names given to the groups by Schiödt, in Kröyer's Tidsskrift.

1. **POMPILUS LEUCOPHÆUS.** *P. schistaceo-pubescentis*; facie albo-maculata; prothoracis margine postica alba; alis fuscis basi hyalinis.

Male. Length $5\frac{1}{2}$ lines. Black, covered with slate-coloured pubescence or pile; a spot on each side of the clypeus, the inner orbits of the eyes, not reaching their vertex, a narrower line behind them and the palpi, yellowish-white; the antennæ stout and tapering to their apex; the hinder margin of the prothorax white and subangulated; wings brown, becoming gradually hyaline to their base; the tibiæ and tarsi strongly spinose; a white spot on the posterior tibiæ near their base; the calcaria nearly as long as the basal joint of the tarsi. Abdomen densely pilose; the apical margins of the three basal segments naked and shining; the four apical segments beneath, naked and shining.

Hab. Malacca.

2. **POMPILUS VAGABUNDUS.** *P. ater*, guttis maculisque flavis variegatus; alis hyalinis apice fuscis; tibiis posticis ferrugineis.

Female. Length $5\frac{1}{2}$ lines. Black; a line on the inner orbits of the eyes; the anterior margin of the clypeus with a narrow line which unites with a quadrate spot on each side of the clypeus, and a narrow line behind the eyes, yellow; the face with a thin silvery pile, and the cheeks with a few white hairs. Thorax covered with a fine silky white

pile, which is more dense on the coxæ and femora beneath; the posterior margin of the prothorax, and a minute spot on the outer margin of the tegulæ, yellow; the wings hyaline, with a dark fuscous cloud at the apex of the anterior pair: the second submarginal cell twice the width of the third, which is subangular; the nervures fuscous; the calcaria and posterior tibiæ ferruginous, the latter black at their extreme base and apex; the tibiæ and tarsi spinose; the anterior tarsi ciliated. Abdomen covered thinly with a fine changeable pile; a transverse yellow fascia near the base of the second and third segments, the first slightly interrupted in the middle, both widest at the sides; a narrow transverse yellow fascia in the middle of the fifth segment, slightly produced upwards in the middle.

Hab. Borneo (Sarawak).

This species has a strong resemblance to the *P. variegatus* of Europe, but from which it is abundantly distinct.

3. *POMPILUS PULVEROSUS*. *P. ater*, pubesque cinerea tectus; alis hyalinis apice nigro-fuscis.

Male. Length 4 lines. Black; entirely covered with a fine glittering white silky pile; the face silvery; head and thorax smooth, shining and impunctate; the hinder margin of the prothorax subangular; the wings hyaline and iridescent, with a slight fuscous cloud beyond the first submarginal cell; the nervures dark fuscous; the legs spinose, with their calcaria nearly as long as the basal joint of the tarsi. Abdomen with a faint tinge of blue in certain lights.

Hab. Borneo (Sarawak).

Subgen. *PRIOCNEMIS*, *Schiödte*.

4. *PRIOCNEMIS SERICOSOMA*.

Pompilus sericosoma, *Smith, Cat. Hym.* p. 146. no. 137.

Hab. Sumatra. Borneo (Sarawak).

5. *PRIOCNEMIS OPTIMUS*. *P. atra*, capite, thorace, dorso metathoracisque lateribus et maculis basi, coxis intermediis, aureo-pubescentibus; alis nigro-fuscis; femoribus posticis ferrugineis, basi apiceque nigris.

Female. Length 8 lines. Black; the head and scape above covered with golden pubescence; the clypeus convex, somewhat produced in the middle of its anterior margin, which is slightly emarginate and recurved; the apex of the mandibles ferruginous. Thorax: the prothorax, mesothorax, scutellum, and sides of the metathorax posteriorly, covered with golden pubescence; a golden spot at the sides of the pectus, close to the base of the intermediate coxæ; the wings dark fuscous with a beautiful violet iridescence; the posterior margin of the inferior pair subhyaline; legs elongate, the middle of the posterior femora ferruginous; the intermediate and posterior tibiæ with a

double row of serrations. Abdomen subpetiolate and covered with a fine silky pile.

Hab. Singapore.

6. *PRIOCNEMIS VERTICALIS*. *P. ater*; vertice antennarumque articulis basalibus flavis; thorace flavo-guttato; alis, tibiis tarsisque flavis.

Female. Length 9-12 lines. Black; the vertex and face above the antennæ and also the scape, yellow; the first and second joints of the flagellum more or less yellow. Thorax: a line on the posterior margin of the prothorax, a quadrate spot on the disk of the mesothorax touching the scutellum, the latter as well as an ovate spot on the post-scutellum, the outer margins of the tegulæ, the tips of the femora, the tibiæ and tarsi, yellow: the claw-joint of the latter black; the wings yellow with their nervures ferruginous; the wings palest towards their apical margins, their extreme edge indistinctly fuscous; the metathorax transversely striated; the posterior tibiæ with two rows of serrations, the intermediate pairs spinose. Abdomen smooth and shining.

Hab. Malacca (Mount Ophir); Borneo (Sarawak).

This species bears a close resemblance to *P. unifasciata*, Smith, 'Cat. Hym.' iii. p. 145, but independent of a difference in the neurcation of the anterior wings, the armature of the legs is totally different: in *P. unifasciata* the posterior tibiæ are armed with long scattered spines, not serrated, as in the present species.

Subgen. *AGENIA*, *Schiödte*.

7. *AGENIA BLANDA*.

Pompilus blandus, *Guér. Voy. Coq. Zool.* ii. pt. 2. p. 260.

Hab. Borneo (Sarawak); Singapore; Malacca (Mount Ophir).

8. *AGENIA ATALANTA*. *A. atra*; capite thoraceque flavo notatis; alis flavis fusco terminatis; tibiis tarsisque flavis.

Male. Length 7-7½ lines. Black; covered with fine silky pile. The clypeus, sides of the face, scape in front, a line behind the eyes, the mandibles and palpi, yellow. The posterior margin of the prothorax, the outer margins of the tegulæ, a quadrate spot on the disk of the mesothorax touching the scutellum, and an ovate spot on the scutellum and post-scutellum yellow; the scutellum prominent; the tibiæ, tips of the femora and the tarsi yellow; the apex of the posterior tibiæ and the claws of the tarsi dusky; the metathorax transversely rugose-striate; the wings yellow, the nervures ferruginous; the tips of the anterior and posterior wings dark brown, with a purple iridescence. Abdomen, with a slight metallic lustre.

Hab. Borneo (Sarawak); Singapore.

9. *AGENIA ÆGINA*. *A. capite abdomineque nigris; thorace sanguineo; alis anticis fascia transversa fusca.*

Female. Length 5 lines. Head and abdomen black, the thorax red. The antennæ beneath and the mandibles ferruginous; the palpi elongate, pale testaceous. Thorax: the wings hyaline and iridescent, with a transverse broad dark fascia before the apex of the anterior wings; the nervures pale ferruginous, with a fuscous stain traversing the apical portion of the externo-medial nervure and the basal portion of the transverso-medial nervure; the anterior legs pale ferruginous; the tarsi, the tibiæ and apex of the femora above, fuscous; the intermediate legs fusco-ferruginous, with a yellow spot on the femora beneath towards their base; the posterior legs fusco-ferruginous; the femora yellow, with their apex fuscous. Abdomen smooth and shining, covered with a fine silky pile.

Hab. Borneo (Sarawak).

10. *AGENIA DAPHNE.* *A. atra*; capite thoraceque maculis auratis ornatis; alis subhyalinis, ad apicem subnubeculosus.

Female. Length 8 lines. Black; the face, vertex and clypeus covered with golden pile; the palpi pale testaceous. The prothorax, the apical margin of the disk of the mesothorax, the scutellum, an oblique stripe beneath the wings extending to the intermediate coxæ, the sides of the metathorax and the coxæ, covered with golden pile; the legs with a fine silky pile; the wings subhyaline, with a slight fuscous cloud before the apex of the anterior pair. Abdomen smooth and shining, covered with a fine changeable glittering silky pile.

Hab. Borneo (Sarawak).

11. *AGENIA LAVERNA.* *A. obscure cyanea*, fascia albida; alis hyalinis; abdomine petiolato, annulo apicali albido.

Male. Length 4 lines. Obscure blue, covered with a fine gray silky pile. The face, clypeus, labrum, palpi and scape in front, white; the labrum exserted; the antennæ as long as the body, testaceous beneath. The anterior femora in front, a narrow line in front of the intermediate pair, not extending to their apex, and a minute spot in front on the tegulæ, white; the wings hyaline and beautifully iridescent, the nervures black; the metathorax with a fine transverse granulation. Abdomen petiolated; the apical segment white.

Hab. Borneo (Sarawak).

This species in many respects approaches closely to the species of the genus *Ceropales*: its exserted labrum, white face, and indistinctly observable joints of the antennæ, are all characteristics of that genus, but the cubital nervure does not run to the apical margin of the wing.

12. *AGENIA MELAMPUS.* *A. atra*; faciei lateribus, margine clypei antica mandibulisque flavis; alis fuscis basi hyalinis; annulis tribus basalibus abdominis ferrugineis.

Male. Length $5\frac{1}{2}$ lines. Black; the sides of the face, the anterior margin of the clypeus, the mandibles and scape in front, yellow, tips

of the mandibles ferruginous; the palpi black. Thorax: the anterior coxæ in front and a minute spot in front of the intermediate pair, yellow; the apex of the femora beneath and the anterior tibiæ in front, ferruginous; the posterior femora slightly ferruginous above; the wings brown with their base hyaline, the posterior pair palest. Abdomen petiolated, with the three basal segments ferruginous; the apical margin of the third segment dusky, covered with a fine white silky pile.

Hab. Borneo (Sarawak).

13. *AGENIA FLAVOPICTA*. *A. atra* flavo variegata; pedibus flavis; alis hyalinis iridescentibus.

Female. Length $3\frac{1}{4}$ lines. Head black; a broad stripe at the inner orbits of the eyes, the clypeus, labrum, mandibles, palpi and scape in front, yellow; the flagellum reddish-yellow, fuscous above beyond the first joint. Thorax: the prothorax, tegulæ, scutellum, post-scutellum, the apex of the metathorax and the legs, yellow; the apical joints of the tarsi fuscous; the metathorax with a changeable golden pile; the wings hyaline and beautifully iridescent, the nervures testaceous. Abdomen: the second, third and fourth segments black with a changeable pile, the apical margins testaceous yellow; the basal and fifth and sixth segments, yellow; the apical segments incurved; the sting elongate.

Hab. Singapore.

14. *AGENIA HIPPOLYTE*. *A. atra*, facie metathoracisque lateribus aureo-pubescentibus; alis flavo-hyalinis; femoribus posticis ferrugineis, basi apiceque nigris.

Female. Length $6\frac{1}{2}$ lines. Black, with a fine changeable pile; the face, clypeus and cheeks covered with a dense pale golden pile. The sides of the metathorax and the posterior coxæ above with a dense pale golden pile; the wings flavo-hyaline, the nervures testaceous; the posterior femora ferruginous, their base and apex black. Abdomen: distinctly petiolated, the apical margins of the segments narrowly rufo-testaceous; the sixth segment with a central longitudinal smooth shining space.

15. *AGENIA CELÆNO*. *A. atra*, cinereo-pubescent; facie abdomineque argenteo-iridescentibus; alis hyalinis apice fuscis.

Female. Length $3\frac{1}{2}$ lines. Black; covered with a changeable cinereous pile, that on the face, coxæ and abdomen having in certain lights a silvery brilliancy; the tips of the mandibles and the palpi pale testaceous; the posterior margin of the prothorax curved; the wings hyaline, with a faint fuscous fascia crossing the superior pair at the second submarginal cell, the apex of the wings narrowly and slightly fuscous; the apical segment of the abdomen nigro-piceous with the extreme apex pale, very glossy, smooth and shining.

Hab. Singapore.

Gen. *MACROMERIS*, *St. Farg.*

Macromeris, *St. Farg. Hym.* iii. 4631.

1. *MACROMERIS SPLENDIDA*.

Macromeris splendida, *St. Farg. Hym.* iii. 464. 2.

Hab. Borneo (Sarawak). India. Java. China. Malacca.

2. *MACROMERIS ARGENTIFRONS*. *M. ater*, pube argentata tecta; facie dense pubescente; alis subhyalinis; metathorace quadrato.

Female. Length 8 lines. Black; covered with a fine silvery silky pile, very dense and brilliant on the face, base and apex of the metathorax, sides of the prothorax and coxæ; the wings subhyaline, the nervures dark ferruginous; the joints of the anterior tarsi remarkably attenuated at the base; the claws of the tarsi small and unidentate; the tibiæ slightly spinose; the thorax subelongate, the sides parallel; the metathorax transversely rugose. Abdomen distinctly petiolated, very smooth and shining, abruptly incurved; the aculeus elongate.

Male. About the same size as the female, similarly clothed with silvery pile; the coxæ greatly swollen; the femora much stouter than in the female, and ferruginous beneath; the anterior tibiæ ferruginous within; the posterior tibiæ bent inwardly at their base; the thorax gradually widening to the apex of the metathorax, which is finely roughened transversely and margined at the truncation. Abdomen small, distinctly petiolated, and very smooth and shining.

Hab. Borneo (Sarawak). Malacca. Singapore. Java.

Gen. *MYGNIMIA*, *Smith.*

This genus of *Pompilidæ* contains all those species which have the first recurrent nervure uniting with the second transverso-cubital nervure, the posterior tibiæ strongly serrated, with a double row of short spines. These insects are in fact the representatives of the *Pepsis* of South America, and embrace some of the largest and most beautiful species of *Pompilidæ*; all, with one solitary exception, (a species from Mexico), are inhabitants of the Old World; *Pepsis*, on the contrary, is almost exclusively found in the New World: I am only acquainted with four exceptions, three being African, and one from Singapore.

1. *MYGNIMIA FLAVA*.

Pompilus flavus, *Fabr. Syst. Piez.* p. 197.

Hemipepsis flavus, *Dahlb. Hym. Europ.* p. 123.

Hab. Borneo (Sarawak). Malacca (Mount Ophir). Singapore. India.

2. *MYGNIMIA ANTHRACINA*.

Mygnimia anthracina, *Smith, Cat. Hym.* pt. iii. 183.

Hab. Borneo (Sarawak). Malacca and Singapore.

3. *MYGNIMIA DUCALIS*. *M. atra*; alis nigris, anticis fascia argentata ornatis.

Black; the abdomen blue-black with a fine silky pile; the third and following joints of the flagellum fuscous, the tips of the joints ferruginous; the clypeus, the scutellum and post-scutellum, obscurely fusco-ferruginous; the metathorax transversely striated, and truncate at the apex; the margin of the truncation raised; the wings brown-black with bright violet and purple shades; a broad silvery band crosses the anterior wings beyond their middle, the band consisting of fine silvery pile. *Female*. Length 1 inch $\frac{3}{4}$.

Hab. Malacca (Mount Ophir).

4. *MYGNIMIA PRINCEPS*. *M. atra*; antennis flavis, alis nigris, anticis fascia subhyalina ornatis.

Female. Length 1 inch 10 lines. Black; with obscure shades of blue, the abdomen blue-black, covered with a fine pile which partakes of purple or blue shades in different lights. The scape of the antennæ ferruginous in front, the flagellum yellow; a ferruginous line bordering the anterior margin of the clypeus. Thorax: the hinder margin of the scutellum obscurely ferruginous; the metathorax coarsely transversely striated; the posterior tibiæ and basal joint of the tarsi with a fine changeable ferruginous pile within; the wings brown-black, with a broad sub-hyaline transverse fascia beyond the middle, the fascia tinged with yellow.

Hab. Borneo (Sarawak).

5. *MYGNIMIA IRIDIPENNIS*.

Female. Length 1 inch. Black; the clypeus densely covered with a short dense black pubescence, slightly emarginate in front; the mandibles obscurely ferruginous in the middle. Thorax: the wings with a splendid lustre of coppery and violet tints, beneath, equally vivid in colour; the metathorax coarsely striated transversely; the pro- and meso-thorax with a short black velvety pubescence. Abdomen sub-opaque, with shades of blue in certain lights.

Hab. Malacca. Sarawak.

Fam. SPHEGIDÆ.

Gen. AMPULEX, *Jurine*.

1. *AMPULEX HOSPES*, *Smith, Cat. Hym.* pt. iv. p. 272.

The particulars in which this remarkable species differs from those with which I have associated it, would perhaps warrant the establishment of a new genus, but only a few specimens have yet been obtained; and although in all, the first transverse cubital nervure is obsolete, still it is a circumstance of frequent occurrence in the genus, particularly in the typical species *A. compressa*. The antennæ are much stouter and shorter, and the posterior angles of the thorax without spines, in all which particulars it differs from the rest of the genus.

2. *AMPULEX COMPRESSA*.

Chlorion compressum, *Fabr. Syst. Piez.* p. 219.

Hab. Malacca (Mount Ophir). Borneo (Sarawak).

3. *AMPULEX SMARAGDINA*. *A. læte viridis*; pedibus abdomineque purpureis; prothorace tuberculato; alis anticis obscure unifasciatis.

Female. Length 8 lines. Brilliant green with shades of violet and coppery effulgence; the vertex angulated, the sides oblique from the margin of the eyes; the antennæ shorter and much thicker than in *A. insularis*. The prothorax subtuberculate in front; the mesothorax, scutellum and post-scutellum, smooth and shining, the former with a longitudinal coppery vitta in middle; the wings subhyaline; the anterior pair with a slight fuscous cloud crossing them from the marginal cell; the legs bright purple; the anterior pair with their coxæ beneath, their femora and tibiæ in front ferruginous. Abdomen brilliant purple, smooth, shining and impunctate.

Hab. Singapore.

4. *AMPULEX INSULARIS*. *A. fulgide viridis*, abdomine purpureo lavato; prothorace elongato, lævigato, nitido, sine tuberculis; alis anticis fasciatis.

Female. Length 8 lines. Brilliant green; the head smooth and shining; the vertex subquadrate with the posterior angles rounded; the clypeus covered with silvery pubescence; the mandibles ferruginous; the antennæ black. The prothorax smooth and shining, not tuberculate; the mesothorax, scutellum and post-scutellum, smooth and shining; the metathorax transversely striated, and having a central and three lateral carinæ, the third recurved inwards at the apex; the sides margined, the apical angles produced into short acute teeth; the wings subhyaline with a fuscous cloud crossing the anterior pair at, and being the width of, the marginal cell; the tibiæ and tarsi obscurely æneous. Abdomen: very smooth and shining, with purple and violet tints; the apex compressed at the sides; the first segment much narrower than the second.

Hab. Borneo (Sarawak).

Gen. *TRIROGMA*, *Westw.*1. *TRIROGMA CÆRULEA*.

Trirogma cærulea, *Westw. Trans. Ent. Soc. Lond.* iii. 225 ♂. *Arcana, Ent.* ii. p. 66 ♀.

Hab. Singapore. Northern India and Madras.

2. *TRIROGMA PRISMATICA*. *T. fulgide cæruleo-viridis*; abdomine purpureo et violaceo lavato.

Male. Length 6 lines. Brilliant green, the abdomen vivid purple or violet in different lights, highly prismatic; the palpi and mandibles white, the latter ferruginous at their apex; the scape of the antennæ green with purple reflexions, the flagellum fuscous; the face below

the antennæ, the scape, cheeks and mandibles, thinly covered with long white pubescence; the head coarsely punctured; a deep transverse impressed line behind the ocelli, the vertex impunctate. Thorax: the prothorax forming a neck, with two elevated tubercles behind; the mesothorax with three or four transverse elevated carinæ at the base, the spaces between rugose; the disk behind, smooth and shining; the scutellum with an elevated shining tubercle in the middle; the metathorax smooth and shining, with an elevated carina traversing its margins; the lateral margins produced at the sides into a blunt angle or tooth; the disk with two longitudinal carinæ which curve towards the sides, then inwardly towards the apical margin, not quite meeting in the centre; between the curved carinæ are two central and two lateral ones, none extending to the outward ones; wings subhyaline and splendidly iridescent; the thorax at the sides and beneath, and also the abdomen, thinly clothed with white pubescence; the third segment above, with scattered short white hairs. Abdomen very delicately and distantly punctured.

Hab. Borneo (Sarawak).

This beautiful species is very distinct from the *Tirogma cærulea*, the only species previously known; the antennæ are much longer and perfectly filiform, the apex of the joints not thickened as in that species.

Gen. SPHEX, *Fabr.*

1. SPHEX SERICEA.

Sphex sericea, *Fabr. Syst. Piez.* p. 211, 19.

Hab. Borneo (Sarawak). Malacca.

This species is very widely distributed: we have seen examples from the islands of the Pacific, the Philippine Islands and Java; some specimens have the scutellum and post-scutellum black; in all probability the *S. ferruginea* of St. Fargeau is a variety of this insect.

2. SPHEX NIGRIPES.

Sphex nigripes, *Smith, Cat. Hym.* pt. 4. p. 254 ♀.

Hab. Singapore. Sumatra.

3. SPHEX DIABOLICUS. *S. ater*; metathorace densissime nigro-pubescent; alis flavo-hyalinis basi fuscis, apice subnebeculosis.

Female. Length 14 lines. Black; the head and thorax opaque; the mandibles very stout, forcipate, acute at their apex and having a stout tooth in the middle of their inner edge; their outer margins fringed with long hairs; the face thinly covered with black pubescence. Thorax: the metathorax covered with a dense black pubescence; a similar-coloured pubescence, but more sparing, clothes the thorax on the sides and beneath; wings flavo-hyaline, blackish at their base;

the apical margins of the anterior pair with a pale fuscous border; the nervures ferruginous. Abdomen: sub-opake, smooth and slightly shining.

Hab. Borneo (Sarawak).

Gen. PELOPÆUS, *Latr.*

1. PELOPÆUS JAVANUS.

Pelopæus Javanus, *St. Farg. Hym.* iii. p. 309.

Hab. Borneo (Sarawak). Malacca. Java.

2. PELOPÆUS FERVENS. *P. ater*; clypeo scapoque antice, pedibus abdomineque ferrugineis; alis subhyalinis.

Female. Length 8 lines. Black; the scape in front, the clypeus and tips of the mandibles ferruginous. Thorax: the posterior margin of the prothorax, the tegulæ, a transverse line at the base of the scutellum, the tips of the anterior and intermediate femora, the posterior pair, except their base, the tibiæ and tarsi, ferruginous; the apical joints of the tarsi fuscous; the wings subhyaline, with a black spot at the apex of the superior pair; the nervures ferruginous; the mesothorax finely striated transversely, the metathorax much more strongly so; the head and thorax thinly covered with long thin pale pubescence. Abdomen: ferruginous, with the base of the petiole black; the three apical segments fusco-ferruginous.

Hab. Borneo (Sarawak).

Fam. LARRIDÆ, *Leach.*

Gen. TACHYTES, *Panzer.*

1. TACHYTES NITIDULUS.

Crabro nitidulus, *Fabr. Piez. Syst.* 309. 7.

Hab. India. Borneo.

2. TACHYTES ARGENTATUS.

Tachytes argentata, *Brullé, Exped. Sc. de Morée*, iii. p. 372.

Hab. Singapore. The Morea. Albania.

3. TACHYTES AURIFEX. *T. ater*; facie aurate pubescente; pedibus ferrugineis; alis flavo-hyalinis; abdomine aurato-fasciato.

Female. Length $10\frac{1}{2}$ lines. Black; the face densely clothed with golden pubescence; the cheeks and vertex behind, with a changeable golden pile; the scape and mandibles at their base, ferruginous, the former black at their base above; the palpi pale ferruginous. Thorax: with a changeable golden pubescence, very dense and shining on the posterior margin of the prothorax, the margins of the mesothorax and on the post-scutellum; the tegulæ and legs ferruginous; the coxæ and femora fuscous; the wings flavo-hyaline, palest towards the apical margins, which have a pale fuscous narrow border. Abdomen:

fusco-ferruginous at the apex ; covered with a thin changeable golden pile ; each segment with a bright golden fascia on its apical margin ; beneath smooth and shining, with the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

Gen. LARRADA, *Smith*.

1. LARRADA EXILIPES.

Larrada exilipes, *Smith, Cat. Hym.* pt. 4. p. 278.

Hab. Borneo (Sarawak).

2. LARRADA CARBONARIA. *L. nigerrima*; capite abdomineque nitidis; thorace opaco; alis rufescenti-fuscis, purpureo læte micantibus.

Female. Length 10 lines. Jet-black, shining; the clypeus delicately punctured; the flagellum fuscous; the cheeks with a fine cinereous pile. Thorax: the pro- and meso-thorax, the scutellum and post-scutellum closely punctured; the metathorax elongate, its superior surface finely shagreened; the truncation finely strigose; the tegulæ testaceous; the wings brown, with a brilliant violet iridescence; the legs strongly spinose. Abdomen: as long as the head and thorax, being smooth, shining and very delicately and sparingly punctured.

Hab. Singapore.

3. LARRADA SYCORAX. *L. nigerrima*, lavigata, nitida, punctata; alis fuscis violaceo-iridescentibus.

Female. Length $7\frac{1}{2}$ lines. Jet-black; shining and finely punctured; the face and cheeks covered with silvery pubescence interspersed with long pale hairs; the metathorax oblong, truncated at the apex; the superior surface with a central impressed longitudinal line, on each side of which it is delicately striated obliquely. The thorax: beneath, the sides and also the legs, covered with a cinereous pile, and sprinkled with long white hairs; the wings brown, with a violet iridescence; their base, as well as the posterior pair, palest. Abdomen: smooth, shining and very delicately and distantly punctured; the margins of the segments slightly depressed and glittering in certain lights with silvery pile.

Hab. Borneo (Sarawak).

4. LARRADA POLITA. *L. nigra*; capite abdomineque nitidis; thorace opaco; femoribus tibiisque intermediis posticis ferrugineis; alis fusco-hyalinis.

Female. Length 6 lines. Black; the head shining, the clypeus closely and finely punctured and covered with silvery pile; the mandibles ferruginous. The pro- and meso-thorax closely punctured, thinly covered with a short glittering pubescence; the metathorax transversely rugose; the thorax on the sides and beneath covered with a fine changeable silvery pile; the intermediate and posterior femora and tibiæ, bright ferruginous; the wings fusco-hyaline and iridescent.

Abdomen : elongate, smooth, shining, and covered with a thin changeable glittering silvery pile ; the apex acute and having a produced ferruginous style.

Hab. Borneo (Sarawak).

5. LARRADA TISIPHONE. *L. nigerrima* ; capite thoraceque subopacis ; metathorace reticulato ; alis fusco-hyalinis.

Female. Length 4 lines. Black ; the head very delicately and closely punctured, sub-opaque ; the face and clypeus covered with silvery pubescence, the mandibles ferruginous at their apex ; the cheeks with a bright silvery pile. Thorax : the pro- and mesothorax closely and finely punctured, the scutellum more delicately and sparingly so, the former sub-opaque, the latter shining ; the metathorax coarsely reticulated ; the tegulæ piceous ; the wings fusco-hyaline and iridescent, the nervures black ; the thorax beneath, and the legs, covered with a fine silky pile. Abdomen : smooth and shining, the apical margins of the segments with fasciæ of silvery pile, only observable in certain lights.

Hab. Borneo (Sarawak).

6. LARRADA ALECTO. *L. nigerrima* ; capite thoraceque subopacis ; metathorace reticulato ; alis fusco-hyalinis.

Female. Length 5½ lines. Jet-black ; the head shining ; the cheeks with a silvery down ; the clypeus impunctate ; the mandibles ferruginous ; the palpi rufo-testaceous. The mesothorax shining, closely and finely punctured ; the scutellum shining ; the metathorax rugose, more finely so towards the verge of the truncation, the latter transversely rugose ; the tegulæ rufo-testaceous ; wings fusco-hyaline, splendidly iridescent, with the nervures black ; the legs strongly spinose, the knees somewhat ferruginous. Abdomen : smooth, shining and impunctate.

Hab. Singapore.

Gen. LARRA, *Fabr.*

1. LARRA PRISMATICA. *L. nigra*, pulchre prismatica, maculis fascisque variis flavis ornata.

Female. Length 4–5 lines. Black, with prismatic tints of violet and blue, particularly on the abdomen. The palpi, labrum, clypeus and a triangular space above it, an abbreviated line at the inner orbits of the eyes, the scape in front and the flagellum beneath, yellow ; the clypeus emarginate in its entire width and a black transverse spot in the middle, a similar spot at the base of the labrum, which is rounded in front. The posterior margin of the prothorax, the tubercles, the outer margins of the tegulæ, an oblique spot on each side of the scutellum, a transverse line on the post-scutellum and an elongate spot on the lateral margins of the metathorax, yellow, the margins compressed ; the anterior legs with the femora beneath and a spot at their apex above, and the tibiæ and tarsi in front, yellow, the claw-joint entirely so ;

the intermediate legs with a line on the femora behind, a spot at their apex in front, the tibiæ in front as well as the tarsi, yellow; the posterior legs with a stripe on the tibiæ in front at their base; the wings hyaline and iridescent. Abdomen: an elongate transverse yellow macula on each side of the basal segment near its apical margin, a yellow fascia on the apical margin of the second segment, widest at the sides, an abbreviated fascia in the middle of the third, an entire one on the fourth, and a spot on each side of the fifth.

Male. Differs in having the clypeus black, two parallel abbreviated yellow lines on the disk of the mesothorax and the fasciæ on the abdomen entire, that on the basal segment being very broad and deeply notched in the middle.

Hab. Borneo (Sarawak).

I have here restored the name *Larra* to one of the insects agreeing with the type, *L. vespiformis*,—the *Stizus vespiformis* of many authors.

Gen. PISON, *Spin.*

1. PISON SUSPICIOSUS. *P. niger*; capite thoraceque rude punctatis; abdomine lævigato, nitido; facie pube argentea ornata.

Female. Length 4 lines. Black; the face with silvery pubescence; the palpi testaceous; the tips of the mandibles ferruginous; the head and thorax strongly and closely punctured, the clypeus finely so. Thorax: the tegulæ testaceous; the wings fusco-hyaline; the first recurrent nervure received at the apex of the first submarginal cell; the second at the apex of the second submarginal; the nervures dark fuscous; the metathorax with a number of coarse radiating striæ at its base; the truncation transversely rugose. Abdomen: very smooth and shining, with a few delicate scattered punctures; the margins of the segments depressed.

Hab. Singapore.

This species very closely resembles the *Pison rugosus*, but it differs from that species in the neurulation of the wings, and also in the puncturing of the abdomen; I suspect that an example in fine condition would have silvery bands on the abdomen.

Subgen. PISONOIDES, *Shuck.*

The anterior wings with one marginal cell, and two submarginal cells, each receiving a recurrent nervure.

1. PISONOIDES OBLITERATUS. *P. ater*, glaber, tenuissime punctatus; facie argenteo-villosa; alis hyalinis iridescentibus; metathoracis basi lævi.

Female. Length $3\frac{1}{2}$ lines. Black; the head and thorax punctured, the mesothorax rather distantly so; the clypeus and the notch of the eyes

with a silvery pubescence; the tips of the mandibles ferruginous; the tegulæ testaceous; the nervures brown; the costal nervure and the stigma black; the tibiæ and tarsi simple; the metathorax with a deep triangular depression at its base, which is obliquely striated on each side, and from which a deep smooth channel runs to the apex of the metathorax; on each side of the depression it is smooth and shining, and finely punctured beyond. Abdomen highly polished, with the margins of the segments deeply depressed; the apical margins with a fine short silky white pubescence; the sixth segment acute at the apex.

Hab. Borneo (Sarawak).

I have formed a section for the reception of this species, which I regard as a true *Pison*, having the petiolated cell obsolete, or rather the apical nervure of the usually enclosed cell. I have seen other species with the nervure obsolete in both, or sometimes only in one wing; the latter circumstance confirms my opinion of this species only being an exceptional case, and that it is a true *Pison*.

Fam. BEMBICIDÆ, *Westw.*

Gen. BEMBEX, *Fabr.*

Bembex melancholica, *Smith, Cat. Hym.* pt. iv. p. 328.

Hab. Borneo (Sarawak). Sumatra.

Fam. CRABRONIDÆ, *Leach.*

Gen. TRYPOXYLON, *Latr.*

1. *Trypoxylon bicolor*, *Smith, Cat. Hym.* pt. iv. p. 377.

Hab. Singapore. Madras.

2. *TRYPOXYLON PETIOLATUM*. *T. nigrum nitidum*, petiolo gracili elongato; abdominis articulis secundo et tertio ferrugineis.

Female. Length 7 lines. Black, very smooth and shining: the clypeus, the inner orbits of the eyes, the emargination of the eyes, and the cheeks, with a glittering silvery pile; the mandibles ferruginous; the palpi pale testaceous. Thorax: the tegulæ, anterior and intermediate tarsi, the extreme base of the posterior tibiæ, the calcaria, and the claws and pulvillus of the tarsi, pale rufo-testaceous; the apical joints of the tarsi fuscous; the sides of the thorax sprinkled with glittering silvery hairs; the wings hyaline, the nervures rufo-fuscous. Abdomen: the petiole slender, as long as the head and thorax, with the apex of its node, the second and third segments, ferruginous; covered with a fine changeable pile, only observable in certain lights.

Hab. Borneo (Sarawak).

3. *TRYPOXYON COLORATUM*. *T. nigrum*, læve, nitidum; pedibus pallide ferrugineis, abdomine subferrugineo supra, obscure maculato.

Male. Length $7\frac{1}{2}$ lines. Black, smooth and shining; the clypeus, mandibles, palpi and scape of the antennæ, covered with golden pile; the cheeks and the emargination of the eyes with a glittering pale golden pile. Thorax: the posterior margin of the prothorax, the tegulæ, tubercles and legs, pale ferruginous; the intermediate and posterior tibiæ beneath, and also the tarsi, fuscous; the apex of the joints of the latter ferruginous; the wings hyaline, their nervures ferruginous, the stigma pale; the sides of the thorax and the metathorax with golden pubescence. Abdomen rufo-testaceous; the petiole, except its base, above, the node at its apex, above, as well as all the segments, more or less black, or rufo-fuscous above; the base and apex of the segments, as well as the apical segment entirely, pale; beneath entirely pale.

Hab. Borneo (Sarawak).

This species is about the size of *T. bicolor*, which it very much resembles, but from which it is very distinct.

Gen. CRABRO, *Fabr.*

1. *CRABRO FAMILIARIS*. *C. niger*, ocellis triangulariter ordinatis, mesothorace punctulato, pedibus flavis, metathorace lævi nitido, abdomine pubescente.

Male. Length $2\frac{1}{2}$ lines. Black: head a little wider than the thorax, shining and delicately punctured; the stemmata in a triangle; the clypeus and cheeks with silvery pubescence; the scape yellow; the flagellum rufo-testaceous, slightly fuscous above; the palpi pale testaceous; the mandibles ferruginous at their apex. Thorax: the collar, tubercles, tegulæ, scutellum and post-scutellum, the extreme base of the wings, and the legs, of a sulphur-yellow; the wings hyaline and splendidly iridescent; the base of the femora and the coxæ slightly ferruginous; the mesothorax delicately punctured; the metathorax smooth and shining, with a central impressed fovea. Abdomen pubescent, with the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

2. *CRABRO RUGOSUS*. *C. niger*, ocellis triangulariter ordinatis in vertice, mesothorace longitudinaliter striato, metathorace rugoso.

Male. Length $2\frac{1}{2}$ lines. Black: head wider than the thorax, quadrate; the stemmata in a triangle on the vertex; an impressed line in front of the anterior stemma extending to the sulcation on the face; an impressed line running round the orbits of the eyes; the cheeks and face with a dense silvery pubescence; the scape yellow; the tips of the mandibles ferruginous. Thorax: an interrupted line on the collar, the tubercles, two spots on the scutellum, the post-scutellum, the tips of the anterior femora, all the tibiæ at their base,

and the basal joint of the tarsi, yellow; the apical joints of the tarsi rufo-fuscous; the yellow markings on the legs paler than those on the thorax; the mesothorax deeply striated longitudinally; the metathorax rugose; the wings hyaline and iridescent. Abdomen: the four basal segments with a small ovate yellow spot at their extreme lateral margins; the fifth with a yellow fascia at its base.

Hab. Borneo (Sarawak).

This species has a remarkably close resemblance to the *Crabro Panzeri* of this country.

Gen. MELLINUS, *Fabr.*

1. MELLINUS CRABRONIFORMIS. *M. niger*, scapo palpis mandibulis tuberculis pedibusque flavis, abdomine ferrugineo.

Female. Length 4 lines. The head and thorax black; the legs and abdomen pale ferruginous; the head and thorax with a thin glittering pale golden pubescence; the palpi, mandibles and scape of a yellowish white; the flagellum testaceous, yellow beneath. Thorax smooth and shining; the tegulæ and base of the wings of a yellowish white; the wings hyaline and splendidly iridescent; the nervures testaceous; the metathorax with a subenclosed space at its base, with a row of sulcations along the basal margin; the sides and apex of the metathorax rugose. Abdomen pale ferruginous, smooth, shining and pubescent; the basal segment petiolated, the petiole curved, clavate at the apex.

Hab. Borneo (Sarawak).

I am aware that this insect, if a strict adherence to the neururation of the wings, as a character for generic subdivision, were rigidly adopted, would form a type of a new genus, but the difference is too slight in my opinion to justify such a course; in other respects it agrees with the insects included in the genus *Mellinus*; the principal difference in the neururation of the present species is the elongation of the third discoidal cell.

Gen. CERCERIS, *Latr.*

1. CERCERIS SEPULCRALIS. *C. capite thoraceque nigris, abdomine ferrugineo.*

Female. Length $7\frac{1}{2}$ lines. Black, with the abdomen ferruginous; the head and thorax finely shagreened; the face with a silvery-white pubescence; the carina between the antennæ, an ovate spot on the clypeus, and the mandibles, obscurely rufo-testaceous. Thorax: a minute obscure spot on the posterior margin of the prothorax, laterally, and a distinct spot on the tegulæ in front, pale yellow; the wings brown, their base subhyaline; the sides of the metathorax covered with hoary pubescence; an indistinct pale spot on the inter-

mediate and posterior tibiæ, outside; the apical joints of the anterior tarsi, and the calcaria, pale testaceous; the tarsi beneath, and the posterior tibiæ within, clothed with a golden-yellow pubescence.

Hab. Borneo (Sarawak).

Group SOLITARY WASPS.

Fam. EUMENIDÆ.

Gen. GAYELLA, *Saussure*.

1. *GAYELLA PULCHELLA*. *G. nigra*, punctata, subnitida, flavo-guttata et fasciata, pedibus ferrugineis flavo-guttatis, alis subhyalinis et iridescentibus.

Female. Length 10 lines. Black: head quadrate; the clypeus deeply emarginate in front, the angles of the emargination produced and denticulate; a large oblong spot behind the eyes, two oblique lines on the vertex nearly touching the summit of the eyes and inclined inwards, a stripe at the base of the scape in front, the labrum and mandibles, yellow. Thorax: the prothorax in front, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ in front and behind, a slightly interrupted transverse line on the scutellum and post-scutellum; a spot beneath the wings, and the sides of the metathorax, yellow; the legs ferruginous; a stripe on the anterior femora outside, another on the anterior and intermediate tibiæ, and a spot at the apex of the posterior pair, yellow; the tibiæ and tarsi fuscous; the wings fusco-hyaline; the anterior margin of the superior pair yellowish, their apex slightly clouded. Abdomen: the lateral and apical margins of the petiole, an ovate spot on each side of the basal segment, a fascia a little before the apical margins of the first, second and third segments, yellow; beneath black.

Hab. Borneo (Sarawak).

Gen. EUMENES.

1. *Eumenes flavopicta*.

Eumenes flavopicta, *Blanch. Dict. d'Hist. Nat. de Ch., d'Orb. Ins.* pl. 2. fig. 2.

Hab. Singapore.

2. *Eumenes Blanchardi*, *Sauss. Mon. Guêpes, Sol.* p. 66.

Hab. Borneo (Sarawak).

3. *Eumenes quadrispinosa*, *Sauss. Mon. Guêpes, Suppl.* p. 134. pl. 7. fig. 2 ♀.

Hab. Malacca.

4. *Eumenes xanthura*, *Sauss. Mon. Guêpes, Sol.* p. 46.

Eumenes circinalis, *Fabr. Syst. Piez.* p. 286 (var.?).

Hab. Borneo (Sarawak).

5. *Eumenes hæmorrhoidalis*.*Vespa hæmorrhoidalis*, *Fabr. Syst. Piez.* p. 259.*Hab.* Borneo (Sarawak).6. *Eumenes quadrata*, *Smith, Trans. Ent. Soc. Lond.* n. ser. ii. p. 36.*Hab.* Borneo (Sarawak).

The specimens from Sarawak only differ from those from China in having the tibiæ and tarsi paler.

7. *EUMENES INCONSPICUA*. *E. nigra* flavo-variegata, capite thorace-
que dense punctato, abdomine sublævigato nitido.

Female. Length 5 lines. Black: the clypeus deeply emarginate at the apex, the angles acute; the basal portion of the clypeus yellow, with a yellow spot above between the antennæ, and a narrow abbreviated yellow line behind the eyes; the tips of the mandibles, and the apex of the flagellum beneath, ferruginous. Thorax: an abbreviated line on the posterior margin of the prothorax in the middle, a spot beneath the wings and another before it, the tegulæ, a spot behind them, the post-scutellum, two spots on each side of the metathorax, the tips of the femora and the tibiæ, yellow; the anterior tarsi yellow, the intermediate and posterior pairs dusky; the intermediate and posterior tibiæ fusco-ferruginous beneath; wings subhyaline, the anterior margin of the superior pair fuscous. Abdomen: a minute spot on each side of the petiole, its apical margin, a larger spot on each side of the second segment and its apical margin, yellow; the following segments with a silky pubescence.

Hab. Borneo (Sarawak).8. *EUMENES SINGULARIS*. *E. nigra* flavo-variegata, capite thorace
petioloque (ad apicem excepto) rude punctato; abdomine lævigato
nitido.

Female. Length 6 lines. Black: the basal and the lateral margins of the clypeus, an oblong spot between the antennæ, a minute spot in the sinus of the eyes and a short line behind them, yellow; the apex of the antennæ ferruginous beneath. Thorax suborbicular; the prothorax in front, two spots on each tegula and another behind them, a transverse line on each side of the metathorax at its base, two ovate ones at its apex, and a spot beneath the wings, yellow; the anterior femora at their apex, the tibiæ, and the intermediate and posterior tibiæ outside, yellow; the wings fusco-hyaline, and iridescent, their apical margins darkest. Abdomen: the petiole longer than the head and thorax; the apical margin of the petiole, an ovate spot on each side of the first segment, its apical margin, and a line in the middle of that of the following segment, yellow; the thorax and abdomen beneath with a fine griseous pile.

Hab. Borneo (Sarawak).

Gen. RHYNCHIUM, *Spinola*.1. *Rhynchium hæmorrhoidale*.*Vespa hæmorrhoidalis*, *Fabr. Syst. Piez.* p. 259.*Hab.* Singapore. Malacca.2. *Rhynchium sanguineum*, *Sauss. Mon. Guêpes, Sol.* p. 110 (var. *R. hæmorrhoidalis*).*Hab.* Borneo (Sarawak).3. *Rhynchium metallicum*, *Sauss. Mon. Guêpes, Sol.* p. 114.*Hab.* Borneo (Sarawak).4. *Rhynchium nitidulum*.*Vespa nitidula*, *Fabr. Syst. Piez.* p. 260.*Hab.* Borneo (Sarawak).

The specimens from Borneo have the clypeus strongly punctured; in other respects they agree precisely with Indian and Javanese examples.

5. RHYNCHIUM OBSCURUM. *R. capite thoraceque rude punctatis, alis apice nigris, abdominis segmento primo rubro-fasciato.*

Female. Length 6 lines. Black: the head and thorax very coarsely punctured; the margins of the clypeus covered with silvery pile; the face with scattered, short, griseous pubescence. Thorax: the tegulæ black and shining; the wings fusco-hyaline; a dark stain along the anterior margin of the externo-medial cell, and a dark fuscous cloud beyond the second submarginal cell occupying the entire apex of the wings. Abdomen: opaque black, the apical margin of the first segment with an obscure ferruginous band; the apical margins of the following segments slightly and very obscurely ferruginous, and covered with fusco-ferruginous pubescence.

Hab. Borneo (Sarawak).Gen. ODYNERUS, *Latr.*1. *Odynerus flavo-lineatus*, *Smith, Cat. Hym.* pt. v. p. 60.*Hab.* Malacca (Mount Ophir). Java.2. ODYNERUS MANIFESTUS. *O. niger, capite thoraceque rude et confluent punctatis, clypeo scapo pedibus et prothorace flavo-guttatis, abdomine fasciis duabus flavis ornato.*

Male. Length 5 lines. Black: the head and thorax covered with deep coarse confluent punctures; a spot on each side of the clypeus, a line on the scape in front, and another behind the eyes, yellow; the clypeus produced and truncate in front. Thorax: a line on the posterior margin of the prothorax in the middle, a spot on the tegulæ in front and behind, the post-scutellum, the apex of the anterior and intermediate femora, and all the tibiæ outside, yellow; the tarsi black; wings subhyaline, the nervures black; the anterior margin of the

superior pair fuscous. Abdomen shining and delicately punctured; the first and second segments with a yellow fascia on their apical margins.

Hab. Borneo.

3. *ODYNERUS SEPTEM-FASCIATUS*. *O. niger* capite thoraceque profunde punctatis flavoque variegatis, abdominis segmentis flavo-marginatis, segmento secundo flavo-fasciato.

Male. Length 5 lines. Black: head and thorax deeply, but not coarsely punctured; the margins of the clypeus, the labrum, mandibles, scape in front, the sinus of the eyes, a longitudinal stripe running from the anterior stemma to the insertion of the antennæ, and a line behind the eyes, yellow. Thorax: a transverse line on the prothorax in front, not touching its anterior angles, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ, two spots on the scutellum, the post-scutellum, the sides of the metathorax, a spot beneath the wings, an oblique line beneath it, and a similar line running down to the posterior coxæ, yellow; the legs yellow, with a fuscous line on the femora above and on the tibiæ behind. Abdomen: the anterior, posterior and lateral margins of the basal segment yellow; a fascia across the middle of the second segment, and another a little before its apical margin, and also before the margins of the three following segments, yellow; beneath, the second segment yellow, with an oblong black spot in the middle; the apical margins of the three following segments yellow.

Hab. Borneo (Sarawak).

4. *ODYNERUS MACULIPENNIS*. *O. niger*, punctatus, capite thoraceque flavo-guttatis, abdominis segmentis singulis flavo-fasciatis, alis apice nigro unimaculatis.

Female. Length $3\frac{1}{2}$ lines. Black: the clypeus, mandibles, antennæ beneath, a spot between them, another in the sinus of the eyes, and a stripe behind them, yellow; the antennæ rufo-fuscous above; the mandibles ferruginous at their apex. Thorax: the anterior margin of the prothorax, the tegulæ and a spot behind them, a spot beneath the wings, the scutellum, a line on the post-scutellum and the sides of the metathorax, yellow; the legs yellow, with the coxæ and the femora above, more or less fuscous; the wings hyaline, with a black spot occupying the greater part of the marginal cell and passing off beyond it to the apex of the wings; the nervures fuscous. Abdomen shining and delicately punctured; the first segment short and cup-shaped, its apical margin thickened; the second segment much wider than the first, its sides rounded; a yellow fascia on the apical margins of the segments, that on the third segment much narrower than the others; an ovate spot on each side of the second segment, at its lateral margins, at the base.

Hab. Borneo (Sarawak).

This species is closely allied to the *O. miniatus* of Saussure.

5. *ODYNERUS MULTIPICTUS*. *O. niger*, capite thoraceque rude punctatis et flavo-variegatis, pedibus flavis, alis hyalinis apice fuscatis, abdomine flavo-fasciato.

Female. Length $5\frac{1}{2}$ lines. Black: the head and thorax rugose-punctate; the mandibles, clypeus, sinus of the eyes, a longitudinal line running from the anterior ocellus to the insertion of the antennæ, a parallel line on each side of the ocelli touching the eyes, a broad stripe behind the eyes, and the scape in front, yellow; a black spot in the centre of the clypeus, and the apex of the mandibles, ferruginous; the flagellum fulvous beneath. The prothorax in front, two longitudinal lines on the mesothorax, two ovate spots on the scutellum, the sides of the metathorax with a large angular spot, the tegulæ, a spot and an oblique line beneath them, and also the legs, yellow; a line on the femora above and on the tibiæ behind, and the coxæ spotted with fuscous; a black spot on the tegulæ; the wings subhyaline and iridescent; a dark cloud on the anterior margin of the superior pair towards their apex. Abdomen smooth and shining; a yellow fascia on the apical margins of the segments, and also a fascia at the base of the first segment, with a transverse spot on each side of the second segment; beneath, the second segment yellow, with a black quadrate spot at its base, a yellow fascia on the apical margins of the following segments.

Hab. Borneo (Sarawak).

6. *ODYNERUS LATIPENNIS*. *O. niger*, angustus, elongatus, alis amplis apice nigro-maculatis, capite thoraceque flavo-guttatis, pedibus flavis, abdomine flavo-fasciato.

Female. Length 6 lines. Black: head and thorax strongly punctured; the clypeus, and an ovate spot above, from which a narrow line runs up to the anterior ocellus, the sinus of the eyes, a stripe behind them and the scape in front, yellow; the flagellum fulvous beneath; the tips of the mandibles ferruginous. Thorax elongate; the prothorax in front, the tegulæ, two spots on the scutellum, and the metathorax, yellow; a longitudinal black line in the middle of the latter; a yellow spot beneath the wings and an oblique line behind it; the legs yellow; the wings very large, subhyaline and iridescent; the nervures towards the base of the wings fusco-ferruginous, towards their apex they are pale testaceous; the costal and externo-medial cells with a slight fuscous cloud; a dark cloud occupying the apical half of the marginal cell and passing on to the apex of the wings. Abdomen: the basal segment campanulate, the apical margins of the segments with yellow fasciæ.

Hab. Borneo (Sarawak).

This species belongs to the subgenus *Symmorphus*.

Group **SOCIAL WASPS.**

Fam. VESPIDÆ.

Gen. ISCHNOGASTER, *Guérin*.

1. *Ischnogaster cilipennis*, *Smith, Cat. Hym.* pt. v.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. *Ischnogaster Mellyi*, *Ann. Soc. Ent. Fr.* 2^e sér. x. p. 25. pl. 2. f. 1.

Hab. Malacca. Sarawak.

3. *ISCHNOGASTER NIGRIFRONS*. *I. niger*, subtus flavo-variegatus, cellulis primo secundoque submarginalibus æquis, tertia breviori et ad cellulam marginalem angustata.

Female. Length 6 lines. Black: the face and clypeus covered with pale golden pubescence, the colour changing in different lights; the clypeus produced at its apex into an acute spine; the scape in front, the flagellum beneath, the palpi and mandibles, yellow, the latter ferruginous at their apex. Thorax globose; the posterior margin of the prothorax, two oblique lines on the mesothorax anteriorly, a spot on each side of the scutellum, the post-scutellum, and two spots at the apex of the metathorax close to the insertion of the petiole, yellow; beneath, fusco-ferruginous; the legs rufo-piceous, with the knees and the anterior and intermediate tibiæ outside, yellow. Abdomen obscurely rufo-fuscos; the first segment petiolated; beneath, with two lines at the base of the node of the petiole; the extreme lateral margins of the first segment, two oblique ones towards its apex beneath, an ovate spot on each side of the two following segments beneath, and the extreme lateral basal margin of the second segment above, yellow.

Hab. Borneo (Sarawak).

4. *Ischnogaster micans*, *Sauss. Mon. Guêpes, Soc.* p. 8.

Hab. Borneo (Sarawak). Malacca.

Gen. POLISTES, *Latr.*

Polistes sagittarius, *Sauss. Mon. Guêpes, Soc.* p. 56.

Hab. Borneo (Sarawak). India. China. Greece.

There is probably no species of this genus which is so widely distributed as the present; the specimens which I have seen from Borneo are all smaller than the Indian ones, and are more highly coloured; the mesothorax has a central longitudinal ferruginous stripe, and the metathorax two longitudinal ones.

Gen. POLYBIA, *Sauss.*

1. *Polybia Sumatrensis*, *Sauss. Suppl. Guêpes, Soc.*

Hab. Sumatra. Borneo (Sarawak). Malacca.

2. *POLYBIA STIGMA*. *P. nigra, flavo-variegata, alis anticis hyalinis, margine antico obscurato, stigmatè flavo.*

Male. Length 5 lines. Black : the clypeus and cheeks with a silvery pubescence ; the mandibles, clypeus, sinus of the eyes, the antennæ beneath, and the cheeks, yellow. Thorax : the anterior margin of the prothorax, the tegulæ and a line beneath the wings, a broad oblique stripe on the sides of the metathorax, the scutellum, post-scutellum, and an oblong-quadrate spot beneath it, and also the legs, yellow ; the femora and tibiæ slightly fuscous behind ; the anterior wings with a dark spot at the apex of the externo-medial cell ; the stigma honey-yellow, with a dark stripe beyond it at the margin of the wing. Abdomen : an ovate spot on each side of the second segment at its base, and a yellow fascia on the apical margin ; the extreme apex of the abdomen yellow ; the fascia on the second segment, continued beneath, and two ovate maculæ at its base.

Hab. Borneo (Sarawak).

This is probably the male of *P. decorata*.

3. *POLYBIA LUCTUOSA*. *P. opaca, nigra, clypei margine antico flavo, segmentis primo tertio quartoque abdominis flavo-marginatis, alis apice nigro uni-maculatis.*

Female. Length 5½ lines. Black : the anterior margin of the clypeus, slightly interrupted in the middle, and a very narrow line at the inner orbits of the eyes, not entering the sinus, yellow ; the head and thorax opaque ; wings hyaline, with a black spot on the anterior margin of the superior pair, near their apex. Abdomen : a narrow yellow fascia on the apical margins of the first, third and fourth segments, the extreme apex yellow.

Hab. Borneo (Sarawak).

4. *POLYBIA DECORATA*. *P. nigra, flavo multidecorata, pedibus flavis.*

Female. Length 5 lines. Black : the clypeus, mandibles, antennæ beneath, the sides of the face and sinus of the eyes, a spot above the clypeus running up into a point as high as the anterior ocellus, and two minute spots on the margin of the vertex, yellow. Thorax : the anterior margin of the prothorax, the tegulæ, and a large broad oblique spot beneath the wings, two longitudinal lines on the mesothorax, the scutellum and post-scutellum, the metathorax and legs, yellow ; the scutellum and metathorax with a longitudinal black line down the middle ; the wings subhyaline, with a fuscous cloud in the marginal cell ; the tibiæ outside, and the tarsi above, slightly fuscous. Abdomen : the first segment campanulate, with a yellow spot on each side at its apex ; the second segment with two very large spots at its base occupying nearly half the length of the segment, and nearly uniting its apical margin as well as those of the three following, with a marginal fascia, yellow ; the apical segment entirely yellow ; beneath

yellow, with only the apical margins of the segments narrowly fuscous.

Hab. Borneo (Sarawak).

Gen. ICARIA, *Saussure*.

1. *Icaria opulenta*, *Smith, Cat. Hym.* pt. v. p. 99. ♀.

The male of this species has been received from Borneo since I described the female, from which it only differs in having the clypeus and mandibles entirely black; in other respects they agree.

2. *Icaria speciosa*, *Sauss. Rev. Zool.* (*Guérin*, 1855) p. 374.

Hab. Borneo. Malacca. Sumatra.

3. *Icaria ferruginea*, *Fabr.*

Polistes ferruginea, *Fabr. Syst. Piez.* p. 277.

Hab. Malacca (Mount Ophir). India.

4. ICARIA LUGUBRIS. *I. opaca nigra pube sericea variabili vestita, alis subhyalinis, apice nigro subnebulosis.*

Female. Length 6 lines. Black: covered with a fine changeable white silky pile; head opaque, delicately roughened; the clypeus angular in front and with a broad white margin, smooth and shining anteriorly; the mandibles smooth and shining, with a white spot at their base. Thorax finely rugose; the sides of the prothorax, the scutellum and post-scutellum, very obscurely tinged more or less with ferruginous, sometimes not observable; the wings subhyaline, with a dark brown stain at the apex of the externo-medial cell, a similar stain occupies the marginal cell, and a paler cloud descends from it across the apex of the wing. Abdomen: the apex of the petiole and the apical margins of the third and following segments very indistinctly tinged with ferruginous, generally black; the third and following segments densely covered with silky pile.

In my Catalogue of Vespidae, I have indicated this species as being a black variety of *I. speciosa*; I had only one or two examples at that time for examination; but having now a series, I am satisfied of their being distinct: in *I. speciosa* the first segment of the abdomen is as broad as long, in the present it is longer than broad.

Hab. Borneo (Sarawak).

5. ICARIA MODESTA. *I. nigra, alis fulvo-hyalinis, abdomine ferrugineo.*

Female. Length 5 lines. Black: the head and thorax roughly punctured; the face and cheeks with short griseous pubescence; the clypeus angular in front, produced into an acute point. Thorax: the posterior margin of the prothorax ferruginous in the middle; the apical joints of the tarsi ferruginous; wings fulvo-hyaline, the ner-

vures dark ferruginous towards the base of the wings, and pale ferruginous towards their apex. Abdomen dark ferruginous, somewhat obscure; the first segment and base of the second bright red; the sides and the apex of the abdomen with a fine silky white pile.

Hab. Borneo (Sarawak).

Gen. *VESPA*, *Linn.*

1. *Vespa cincta*, *Fabr. Syst. Piez.* p. 254.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. *Vespa affinis*, *Fabr. Syst. Piez.* p. 254 (var. *V. cincta*?).

Hab. Malacca.

3. *Vespa tyrannica*, *Smith, Cat. Hym.* pt. 5. p. 119.

Hab. Singapore.

4. *Vespa* (anomala) *dorylloides*, *Sauss. Mon. Guêpes, Soc.* p. 112.

Hab. Borneo (Sarawak). Malacca. Singapore.

5. *Vespa bellicosa*, *Sauss. Mon. Guêpes, Soc.* p. 146.

Hab. Borneo (Sarawak).

6. *VESPA ANNULATA*. *V. nigra*, scutello flavo-maculato, post-scutello metathoraceque flavis, illo in summo nigro, segmentis tenuibus flavo marginatis.

Worker. Length 10 lines. The clypeus emarginate in front, its lateral angles acute and slightly produced; an elongate-quadrate black spot in the middle not extending to the anterior margin; the cheeks, mandibles, clypeus, a coronet-shaped spot above, the emargination of the eyes, the scape in front and the flagellum beneath, yellow. Thorax: a narrow line on the anterior and posterior margins of the prothorax, the tegulae and a spot beneath the wings, an ovate spot on each side of the scutellum, the post-scutellum and metathorax, yellow; wings subhyaline, with a narrow fuscous stain at the anterior margin of the superior pair; legs yellow, with a fuscous stain on the tibiae and femora above. Abdomen: two large spots at the base of the first segment, and a narrow fascia on the apical margins of all the segments, yellow; the yellow bands abruptly widened laterally; the abdomen yellow beneath, with the base of the segments blackish.

Hab. Borneo (Sarawak). Malacca.

Fam. *TENTHREDINIDÆ*, *Leach.*

1. *TENTHREDO CONALIS*. *T. chalybea*, clypeo palpis trochanteribus coxarum apicibus tibiisque postice albis, alis hyalinis.

Female. Length 4 lines. Steel-blue; the antennae black; the clypeus and palpi white. Thorax: a line before and a spot beneath the tegulae,

the trochanters, apex of the coxæ, the knees and the tibiæ behind, white; the wings hyaline and iridescent; the nervures and stigma dark brown; two minute white spots on the post-scutellum; the extreme apex of the abdomen with a white spot.

Hab. Singapore.

Gen. TREMEX, *Jurine*.

1. TREMEX INSULARIS. *T. ater*, capite thorace disco viridibus, abdomine et thorace flavo-variegatis, alis subhyalinis, margine antico fuscis.

Female. Length 8 lines. Head brassy-green, strongly punctured; the antennæ black with the apical joints yellow; the face thinly covered with white pubescence. Thorax: the disk and the scutellum with a green tinge; the pro- and metathorax above yellow; the segments of the abdomen have each a yellow fascia, the first two slightly interrupted, the terminal segment with an oblique yellow stripe on each side; the tibiæ yellow, the tarsi ferruginous; the base of the abdomen yellow beneath; the wings subhyaline, a dark fuscous stain along the anterior margin of the superior pair, the apical margins of both wings fuscous.

Hab. Borneo (Sarawak).

Fam. CYNIPIDÆ, *Westw.*

1. CYNIPS INSIGNIS. *C. flavo-ferruginea*, antennis fuscis, alis flavo-hyalinis apice fuscis.

Female. Length $4\frac{1}{2}$ lines. Reddish-yellow, smooth and shining, rather paler beneath; the flagellum slightly fuscous, with the base and apex pale; tips of the mandibles black; the mesothorax deeply and transversely grooved; the base of the wings flavo-hyaline; from the base of the stigma to the apex dark fuscous; the insect is thinly covered with a short pale pubescence; the ovipositor black; the sheath and the claws dark ferruginous.

Hab. Borneo (Sarawak).

Fam. ICHNEUMONIDÆ, *Leach*.

1. ICHNEUMON PENETRANS. *I. niger*, capite thoraceque flavo variegatis, pedibus flavis nigro-maculatis, abdominis annulis flavo-marginatis.

Female. Length 8 lines. Black: the face below the insertion of the antennæ, the labrum, mandibles, palpi, cheek, inner orbits of the eyes, and the antennæ, yellow; the scape and base and apex of the flagellum black: a black spot above the clypeus, and the apex of the mandibles ferruginous. Thorax: the lateral margins of the prothorax, a

spot on the tegulæ, two longitudinal spots on the mesothorax, the scutellum, post-scutellum, two spots on the metathorax behind and a line at the sides, two oblique maculæ on the sides of the thorax and the legs, yellow; the anterior and intermediate legs with a fuscous line outside; the posterior femora and the apex of the tibiæ black; wings hyaline. Abdomen: the base of the petiole and its apical margin yellow; the base of the first segment and the apical margins of all the segments with a yellow fascia; beneath entirely yellow.

Hab. Borneo (Sarawak).

2. *ICHNEUMON COMISSATOR*. *I. niger*, antennis medio albis, thorace pedibusque flavo variegatis, abdominis petioli basi marginibus basilibus segmentorum trium sequentium duobusque segmentis apicalibus flavis.

Male. Length 7 lines. Black: antennæ white in the middle; the head is yellow, except the hinder part of the vertex, and a black stripe running from the vertex to the insertion of the antennæ. The prothorax has the anterior and posterior margins yellow; the tegulæ, two spots on the disk of the mesothorax, the scutellum and post-scutellum, and metathorax, yellow; a black spot on the tegulæ, another on the scutellum, and a black T-shaped mark on the metathorax; the thorax with yellow maculæ on the sides, and the legs yellow; the anterior and intermediate legs with a black line outside, and the posterior femora and apex of the tibiæ black. The petiole of the abdomen yellow, with a black macula at its apex; the first, second and third segments with a broad, deeply emarginate fascia at their base; the two apical segments entirely yellow.

Hab. Borneo (Sarawak).

Gen. *CRYPTUS*, *Fabr.*

1. *CRYPTUS CROCEIPES*. *C. niger*, metathorace bispinoso, antennis medio tarsisque posticis et abdomine apice albis, pedibus flavis.

Female. Length 5 lines. Black: subopake, with the apex of the abdomen white above; the middle of the antennæ, above, white about one-third of their length; the legs yellow; the posterior tibiæ and claw-joint of the tarsi, and also the anterior tarsi, fuscous; the posterior tarsi white; the wings hyaline and iridescent, with a faint cloud at the apex of the first submarginal cell, the stigma and nervures, black; the metathorax armed with two short spines which are white at their tips.

Hab. Borneo (Sarawak).

2. *CRYPTUS ELEGANS*. *C. niger*, antennis medio scutelloque et abdominis apice albis, alis hyalinis macula fusca ad apicem, abdominis fasciis albis, thorace bispinoso.

Female. Length $4\frac{1}{2}$ lines. Black: the scape pale rufo-testaceous, the apical half of the flagellum and the palpi white; the apex of the flagellum, and the outside of the white portion, fuscous. The tegulæ, scutellum, a line on the post-scutellum, and the posterior tarsi, white; the legs pale rufo-testaceous; the metathorax rugose and armed with two white spines; the wings hyaline, with a fuscous stain descending from the stigma to the inferior margin of the discoidal cell. Abdomen: the basal segment rufo-testaceous at the base and white at its apical margin; the second segment black at its base, then rufo-testaceous, becoming white at its apical margin; the apex of the abdomen white.

Hab. Borneo (Sarawak).

3. *CRYPTUS LEPIDUS.* *C. niger*, alis hyalinis, tarsis posterioribus albo-, metathorace transverso-striatis, abdominis apice albo.

Female. Length 6 lines. Black; shining: antennæ white in the middle; the wings hyaline, the nervures black; the anterior and intermediate legs, and the posterior coxæ, reddish-yellow; the anterior and intermediate tarsi fuscous, the posterior pair white; the three apical segments white above; the posterior margins of the second and third segments with very narrow white fasciæ; the metathorax transversely striated.

Hab. Borneo (Sarawak).

Gen. *PIMPLA*, *Fabr.*

1. *Pimpla punctator.*

Ichneumon punctator, *Linn. Syst. Nat.* i. 935. 38.

Pimpla pedator, *Fabr. Syst. Piez.* p. 114. 6.

Hab. India. Borneo (Sarawak).

Gen. *MEGAPROCTUS*, *Brullé.*

1. *MEGAPROCTUS RUFICEPS.* *M. niger*, capite ferrugineo, thorace abdominisque segmento primo et secundo rugosis, alis hyalinis, tarsis posterioribus albis.

Female. Length 8 lines. Head and scape of the antennæ ferruginous, smooth and shining; the flagellum and tips of the mandibles black. Thorax opaque black, rugose, but not coarsely so; the mesothorax convex in front, sub-bituberculate, the tubercles obsoletely ferruginous; the wings hyaline, the nervures black; the base of the tibiae, the apex of the first and second joints of the anterior tarsi, the third and fourth entirely, the intermediate pair wanting, and the posterior pair, white; the claw-joint of the latter black. Abdomen opaque black, broad at the base and slightly widening to the apex; the first segment and a large angular shape in the middle of the second with large close punctures; on each side of the angular shape it is longi-

tudinally rugulose; the apical segments smooth and shining; the ovipositor a little longer than the insect.

Hab. Singapore.

Gen. RHYSSA, *Grav.*

1. RHYSSA MIRABILIS. *R. capite thorace pedibus anticis et intermediis sanguineo-rubris, coxis intermediis antice posticisque a tergo, albis, alis fuscis, abdomine basi nigro sensim ad apicem pallidiore, apice flavescenti-albo, ovipositore elongato.*

Female. Length 13 lines. Head, thorax and anterior legs ferruginous; the mandibles black; wings dark fuscous, with a coppery effulgence; the intermediate and posterior legs dark rufo-piceous; the intermediate coxæ in front and the posterior pair behind, white; the intermediate tibiæ ferruginous in front, the tarsi fuscous; the apex of the metathorax above black, smooth and shining. Abdomen smooth and shining, black at the base, and gradually becoming paler to the apex, which is pale yellowish-white; the apical segments deeply emarginate in the middle above; the ovipositor one-third longer than the body.

Hab. Borneo (Sarawak).

2. RHYSSA MACULIPENNIS. *R. nigra, flavo dense maculata, alis anticis macula magna fusca ad apicem.*

Female. Length 10 lines. Black: the face, inner and outer orbits of the eyes, and a spot on the scape in front, yellow. Thorax: the posterior margin of the prothorax, the tegulæ and two spots beneath the wings, the scutellum and a minute spot on each side, at its anterior angles, a spot on the post-scutellum, a trilobate spot on the metathorax, in the middle, and a large irregular macula at the sides, yellow; the legs yellow; the tarsi fuscous; the anterior coxæ behind and the femora and tibiæ outside with a rufo-piceous stain, the intermediate and posterior black and spotted with yellow, the femora black above, the tibiæ fuscous at their base behind; the wings hyaline, with a faint yellow tinge, the nervures black, the stigma ferruginous; a large dark brown macula on the anterior wings placed at the apex of the stigma. Abdomen: a longitudinal yellow spot in the middle of the two basal segments, and an oblique ovate yellow spot at the sides of the three following segments towards their apical margins; the ovipositor one-fourth longer than the body.

Hab. Borneo (Sarawak). Singapore.

Gen. MEGISCHUS, *Brullé.*

1. MEGISCHUS INSULARIS. *M. niger, capite ferrugineo, thorace abdominisque segmento primo rugosis, alis subhyalinis, ovipositore ad apicem albo annulato.*

Female. Length 10 lines. Black: the head red, coarsely rugose, having three or four deep transverse curved grooves above the ocelli, in front

of which is a triangular shallow cavity which has several radiating carinæ; the corners of the triangle raised and recurved; the antennæ and palpi black. Thorax coarsely rugose, having a mixture of transverse sculpturing and large shallow punctures; wings fusco-hyaline, with the nervures black, a slight fuscous cloud in the first discoidal cell; the posterior margin of the prothorax narrowly pale testaceous; the posterior coxæ transversely rugose-striate; the posterior femora incrassate, denticulate beneath. Abdomen: the first segment transversely striated, the following smooth and shining; the ovipositor a little shorter than the body.

Male. About the same size as the female, similarly coloured and sculptured; the posterior femora similarly denticulate; the first segment of the abdomen more finely striated, the apical margins of the third and three following segments notched in the middle.

Hab. Sarawak.

Gen. MACROGASTER, *Brullé*.

1. MACROGASTER FLAVO-PICTUS. *M. nigro flavoque varius, alis anticis macula magna nigro-fusca ad apicem.*

Female. Length 15 lines. Head black; the face, cheeks, mandibles, and scape in front, yellow. Thorax black, transversely rugose; the posterior margin of the prothorax, a small and a large spot beneath the wings, the legs and breast in front, four spots on the mesothorax, a spot on the scutellum and a smaller one at each side, the tegulæ, and the base and sides of the metathorax, yellow; the wings hyaline; the nervures black; the stigma yellow; a large dark fuscous macula at the apex of the marginal cell extending across the second submarginal cell. Abdomen black and subopaque, with the apical margins of the segments smooth and shining; each segment with a yellow fascia before its apical margin, the two basal fasciæ widest in the middle, the four following narrowest in the middle, or the two last slightly interrupted; the ovipositor twice the length of the insect.

Hab. Singapore.

This species may possibly be a *Rhyssa* with the petiolated submarginal cell obsolete; the neuration of the wing agrees with that of Brullé's genus *Macrogaster*. I am not acquainted with any other genus to which it could belong; the antennæ are those of *Rhyssa*, not apparently of *Macrogaster*.

Gen. OPHION, *Fabr.*

1. OPHION IRIDIPENNIS. *O. rufo-ferrugineus, capite postico flavo, abdomine fusco basi ferrugineo, metathorace rugoso.*

Female. Length 10 lines. Reddish-yellow; the eyes distinctly emarginate; the face smooth and shining, slightly convex; the tips of the mandibles black; the head yellow behind. Thorax: the mesothorax smooth and shining, with a central longitudinal fuscous stripe; the metathorax coarsely transversely rugose, with a series of short longi-

tudinal striæ at the base; wings hyaline and splendidly iridescent, the nervures ferruginous, with the costal nervure and stigma much darker. Abdomen fuscous, with the first, second, and base of the third segments ferruginous.

Hab. Borneo (Sarawak).

2. *OPHION VESTIGATOR*. *O. rufo-testaceus*, abdomine apice fusco, metathorace subrugoso.

Female. Length 10 lines. Pale rufo-testaceous: eyes deeply emarginate; wings hyaline and iridescent, the nervures fusco-ferruginous; the meso- and metathorax rugose; the four apical segments of the abdomen fuscous and covered with short cinereous pubescence.

Hab. Malacca.

Gen. *XYLONOMUS*, Grav.

1. *XYLONOMUS FULGIDIPENNIS*. *X. opacus*, niger, antennis flavo-annulatis, alis nigris aureo-fulgentibus, abdomine nigro-chalybeo.

Female. Length 14 lines. Black and opaque: antennæ annulated with yellow; the thorax narrowed anteriorly; the metathorax large and wide; the wings dark brown, with a bright coppery effulgence; the tegulæ and two spots at the base of the metathorax obscurely blue. Abdomen blue-black, with bright tints of blue in certain lights.

Hab. Sarawak.

I have assigned this fine insect to the genus *Xylonomus*, to which it appears to belong; the neuration of the wings and the enlarged metathorax connect it with that genus.

Fam. *BRACONIDÆ*, Westw.

Gen. *BRACON*, Fabr.

1. *BRACON ACULEATOR*, Fabr. *B. ferrugineus*, antennis aculeoque nigris, alis flavescentibus, puncto marginali nigro.

Ichneumon aculeator, Fabr. *Ent. Syst.* ii. 159. 105.

Bracon aculeator, Fabr. *Syst. Piez.* 107. 21.

Hab. Malacca (Mount Ophir). Borneo (Sarawak). Tranquebar.

2. *BRACON QUADRICEPS*. *B. capite thorace pedibus anticis et intermediis coxisque posticis ferrugineis, pedibus posticis et abdomine nigris, alis fuscis basi hyalinis.*

Female. Length $7\frac{1}{2}$ lines. Head, thorax, anterior and intermediate legs, and the posterior coxæ, ferruginous; the head and thorax smooth and shining, the former quadrate; the clypeus deeply emarginate; the scape and first joint of the flagellum ferruginous within; the wings yellow to the apex of the externo-medial cell, beyond which they are fuscous and mottled with a number of semitransparent spots; the base of the stigma reddish-yellow. Abdomen and posterior legs black; the first segment of the abdomen at an oblique angle with the following segments, above, with a central and two lateral carinæ, outside of which it is yellow; the second and third segments longitudi-

nally rugose-striate; the following segments smooth and shining; the ovipositor ferruginous, the sheaths black and very pubescent.

Hab. Borneo (Sarawak).

This species, which has the posterior tarsi thickened and the abdomen angulated at the base, I have little doubt belongs to the genus *Myosoma* of Brullé.

3. *BRACON SUSPICIOSUS*. *B. capite thorace pedibus anticis et intermediis sanguineo-rubris, alis fuscis, abdomine nigro.*

Female. Length 8 lines, of the ovipositor 9 lines. Black: the head, scape of the antennæ, anterior legs, pro- and mesothorax, ferruginous; the head subquadrate, very smooth and shining; the clypeus emarginate its entire width, the tips of the mandibles black. The thorax highly polished above; the wings dark fuscous, with a semi-hyaline streak crossing the lower angle of the first submarginal cell; the posterior tibiæ and tarsi stout. The first segment of the abdomen at right angles with the following segments; the second and third segments longitudinally striated, the following segments smooth and shining.

Hab. Borneo (Sarawak).

This species in all probability belongs to Brullé's genus *Myosoma*.

4. *BRACON INSIGNIS*. *B. capite thorace pedibus anticis et intermediis ferrugineis, metathorace supra nigro, abdomine pedibusque posticis nigris, alis nigro-fuscis, ovipositore corpore quadruplo longiore.*

Female. Length of the body 11 lines, of the ovipositor 44 lines. Head, thorax, anterior and intermediate legs ferruginous; the head and thorax smooth and shining, the antennæ black; the metathorax, posterior legs, and abdomen, black, wings dark fuscous; beneath the first submarginal cell is a minute hyaline spot. Abdomen: the basal segment, and a triangular impressed shape at the base of the second in the middle, longitudinally striated; the second, third, and fourth segments with a rugose striation, radiating from the middle of each segment; the apical segments smooth and shining; the ovipositor ferruginous, the sheaths black and pubescent.

Hab. Borneo (Sarawak).

5. *BRACON CEPHALOTES*. *B. rufescenti-flavus, antennis et ovipositore nigris, alis flavo-hyalinis, macula nigra ad stigmatis basin, alteraque in cellula prima discoidali.*

Female. Length 8 lines. Rufo-flavous; antennæ and tips of the mandibles black; anterior margin of the clypeus entire; head wider than the thorax, quadrate, smooth, and shining. Thorax very smooth, shining; the mesothorax very convex anteriorly, with an oblique depression on each side anteriorly; the wings flavo-hyaline, with a black macula at the base of the stigma, and a smaller one at its apex, a third macula in the first discoidal cell, and an oblong stain beyond it on the margin of the wing; the posterior wings with their apex and inferior margin fuscous; the posterior tarsi slightly fuscous. Abdo-

men smooth and shining, the basal segment with a deep fovea anteriorly, and a convex shape beyond extending to the posterior margin; the two following segments with an oblique depression on each side.

Hab. Borneo (Sarawak).

This species resembles the *B. aculeata*, Fabr., but differs in not having the thorax narrowed anteriorly, and in having an additional spot on the wings; the head is also much larger, and in what I consider to be *B. aculeata*, the two basal joints of the antennæ are pale ferruginous.

6. *BRACON PERPLEXUS*. *B. flavus*, vertice macula triangulari notato, antennis tarsisque posticis et ovipositore nigris, alis fuscis, dimidio basali flavis.

Female. Length 6 lines. Yellow: the vertex with a large triangular shape, which extends to the insertion of the antennæ, the tips of the mandibles and the antennæ, black; the head smooth and shining; the thorax smooth and shining, with the posterior tarsi dusky; wings yellow-hyaline as far as the apex of the externo-medial cell, beyond which they are of a uniform black, not intense in colour, and with an oblong hyaline streak in the first submarginal cell and two ovate ones below; the stigma yellow at the base. Abdomen: the first segment with a central longitudinal convex shape in the middle, which, as well as the two following segments, is longitudinally striated; the ovipositor black.

Hab. Borneo (Sarawak).

7. *BRACON VAGATUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine maculaque metathoracis nigris, alis flavescens*.

Female. Length 5 lines. Head, thorax and legs, smooth, shining, ferruginous, the antennæ black, a fuscous spot on the vertex. Thorax smooth and shining; the metathorax black above, and the posterior legs black; the wings flavo-hyaline; a black spot at each end of the stigma; the apex of the posterior wings and the apical portion of the inferior margin of the superior pair, slightly fuscous. Abdomen: the lateral and apical margins of the basal segment, and the apical margins of the third and following segments, yellow; the basal segment with a longitudinal deep lateral channel and a central carina; the second segment rugose, with the apical margin and three triangular spaces at the base, smooth, shining, black; the third segment with an oblique deeply impressed line on each side, the ovipositor black.

Hab. Malacca (Mount Ophir).

8. *BRACON INQUIETUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine alis maculaque metathoracis nigris*.

Female. Length 9 lines. Head, thorax, anterior and intermediate legs, ferruginous; the face with a triangular flattened projecting appendage at the base of the clypeus; the antennæ black, the head quadrate, smooth and shining. Thorax smooth and shining, with a black spot on the metathorax above; the wings and posterior legs black. Ab-

domen finely rugose, the basal segment with two deeply impressed smooth longitudinal channels, the lateral margins yellow, beneath yellow; the ovipositor with its sheaths very pubescent.

Hab. Sarawak.

This species probably belongs to the genus *Myosoma* of Brullé.

9. *BRACON RUGIFRONS*. *B. niger*, capite thorace pedibusque anticis et intermediis ferrugineis, alis nigris.

Female. Length 5 lines. Black: head, thorax, anterior and intermediate legs ferruginous, the scape ferruginous; the thorax and the vertex smooth and shining, the face rugose; the head subquadrate; the thorax much narrowed towards the head; the mesothorax with two longitudinal smooth elongate impressed lines converging towards the scutellum; the wings of a uniform dark fuscous. Abdomen: the three basal segments longitudinally and irregularly striated; the basal segment margined laterally and having a central carina, the second segment with a central and two converging carinæ; the third segment with a deep transverse depression, the apical margin smooth and shining; the fourth segment irregularly depressed and striated at the base.

Hab. Borneo (Sarawak).

10. *BRACON FLORALIS*. *B. niger*, capite thorace pedibusque anticis ferrugineis, antennis pedibusque intermediis et posterioribus, alis et abdomine maculaque metathoracis nigris.

Female. Length $6\frac{1}{2}$ lines. Head, scape of the antennæ, thorax, anterior and intermediate legs, ferruginous; the head and thorax very smooth and shining; the thorax narrowed anteriorly into a neck; the mesothorax with two elongate converging smooth impressed lines; the metathorax dark rufo-piceous above, with a bright ferruginous line down the centre; the intermediate tibiæ and tarsi black; wings dark brown, with a hyaline spot at the inferior angle of the first submarginal cell. Abdomen smooth and shining; the first segment with a deeply impressed channel on each side, and a central impressed line extending from the base half way towards the apex; the second segment with a spear-shaped elevation in the middle of its base, and a lateral deep longitudinal excavation at the sides; the third segment with an oblique impressed line at the sides.

Hab. Borneo (Sarawak).

11. *BRACON VULTUOSUS*. *B. capite thorace pedibusque anticis ferrugineis*, abdomine pedibusque intermediis et posticis, abdomine maculaque metathoracis nigris.

Female. Length 7 lines. Black: head, thorax and anterior legs, the scape and basal joints of the flagellum in front, ferrugineous; the face with a projecting flattened appendage at the base of the clypeus; the scape fringed with black hairs on its inner margin. Thorax smooth and shining; the metathorax obscure, black in the middle and

rufopiceous at the sides, above; wings fuscous, palest towards their apex, with the stigma yellow; the intermediate legs with the knees ferruginous. Abdomen opaque, finely rugose; the basal segment with a longitudinal striation, a deeply impressed space at the sides, with the extreme lateral margins, yellow; the second segment with a small arrow-headed raised shape in the middle of its base and an oblique impressed line on each side; the two following segments have also oblique impressed lines at the sides; the third and fourth segments with their apical margins straight in the middle and abruptly oblique at the sides.

Hab. Singapore.

12. *BRACON FOVEATUS*. *B. capite thorace pedibusque anticis ferrugineis, alis nigris, ovipositoreque elongato pubescentibus.*

Female. Length 7 lines. Black: head, thorax, scape in front and the anterior legs, ferruginous; the face punctured, the thorax smooth and shining; the mesothorax with two converging longitudinal depressions extending to the scutellum; the wings dark fuscous; the intermediate tibiæ at their apex in front obscurely ferruginous. Abdomen: the four basal segments longitudinally rugose; the basal segment with a longitudinal smooth shining depression on each side; the second segment with two triangular smooth depressions and a longitudinal one on each side running onwards and terminating in a large fovea; the third and fourth segments with a smooth shining fovea on each side, the fifth and sixth segments smooth and shining; the ovipositor more than twice the length of the insect, and very pubescent.

Hab. Singapore.

13. *BRACON LABORIOSUS*. *B. capite thoraceque flavo-variegatis, pedibus anterioribus et intermediis flavis, abdomine annulis flavo-marginatis.*

Female. Length 7 lines. Black: the face, mandibles and cheeks, of a reddish-yellow; a black triangular spot in the middle of the face. Thorax shining, much narrower towards the head; a line before the tegulæ uniting with a large spot beneath the wings, a transverse space between the posterior wings, the metathorax above, the tegulæ and legs, yellow; a transverse black patch at the base of the metathorax with a line running backwards from each extremity; the posterior legs black with the knees yellow; the wings yellowish-hyaline, the nervures pale ferruginous, the apex of the wing slightly fuscous, a black spot at the base of the first submarginal cell, the stigma pale ferruginous. Abdomen: the basal segment yellow, with a shining black spot in the middle; the apical margins of the four following segments yellow; the abdomen yellow beneath, with an elongate black line on each side of the segments.

Hab. Borneo (Sarawak).

14. *BRACON CRASSIPES*. *B. capite thorace pedibusque antice ferrugineis,*

metathorace supra nigro-piceo, abdomine pedibusque intermediis et posticis nigris, alis hyalinis basi fuscis.

Female. Length 8 lines. Head smooth and shining; antennæ and tips of the mandibles black; clypeus deeply emarginate. Thorax: much narrowed towards the head, smooth and shining; the wings subhyaline, the posterior pair fuscous towards the base, the superior pair yellowish, the nervures pale ferruginous, the costal nervures dark ferruginous, the stigma pale; the legs thick, particularly the posterior pair, the intermediate tibiæ ferruginous at the base. Abdomen: the basal segment at right angles with the following segments; the base of the second segment with an impressed oblique line on each side, and a central carina, each extending to about the middle of the segment; all the segments of an opaque black, and margined posteriorly; the margin of the second segment curved and strongly crenulated, the abdomen yellow beneath.

Hab. Singapore.

Gen. AGATHIS, *Latr.*

1. *Agathis flavipennis*, *Brullé, Hym. iv. p. 484. 3.*

Hab. Singapore. India.

Gen. MICRODUS, *Esenbeck.*

1. *MICRODUS APICALIS.* *M.* capite thorace pedibusque anticis et intermediis pallide ferrugineis, abdomine pedibusque posticis, mesothorace trimaculati et metathorace supra nigris, alis flavescentibus apice fuscis.

Female. Length $5\frac{1}{2}$ lines. Head and thorax pale red; the antennæ, a spot enclosing the ocelli and the eyes, black. Thorax: the mesothorax divided into three elevations by two oblique converging deeply impressed lines, each division with a black stripe in the middle; wings yellow, fuscous beyond the apex of the stigma, the fuscous cloud inclining inwards and crossing both wings. Abdomen: the three basal segments longitudinally striated; their lateral margins and the apical margin of the basal segment, yellow; the abdomen yellow beneath. The ovipositor about the length of the insect.

Hab. Singapore.

Fam. CHALCIDIDÆ, *Walker.*

Gen. EPISTENIA, *Westwood.*

1. *EPISTENIA IMPERIALIS.* *E.* capite thoraceque purpureis rude punctatis, alis hyalinis, abdomine versicolori, segmentis apicalibus basi testaceis.

Female. Length $7\frac{1}{2}$ lines. Head and thorax of a rich purple, the metathorax with tints of bright green; the legs black, the apex of the joints rufo-piceous as well as the apical joints of the tarsi. Abdomen: of

changeable hues, partaking of tints of blue, purple, violet or green, in different lights; the three basal segments deeply emarginate above, with central longitudinal depressions extending to their base; the ovipositor thick and pubescent, two-thirds of the length of the abdomen.

Hab. Borneo (Sarawak).

This beautiful insect appears to belong to the genus *Epistenia*, established by Westwood in Griffith's 'Animal Kingdom;' if not so, it is very closely allied.

Fam. CHRYSIDIDÆ, *Leach.*

Gen. HEDYCHRUM, *Latr.*

1. HEDYCHRUM ORIENTALE. *H. viridi-cyaneum*, capite thoraceque confertissime punctulatis, abdominis segmenti tertii margine apicali arcuato integerrimo, alis subhyalinis.

Length $2\frac{1}{2}$ lines. The head and thorax very coarsely punctured, the abdomen more delicately so; the abdomen of a bright green, with blue tints in different lights, the flagellum fusco-testaceous, the mandibles ferruginous at their apex; the deep concavity of the face, in which the scape rests in repose, delicately transversely striate; the tooth at the lateral angles of the metathorax acute; the abdomen nigro-æneous beneath, with a thin, short, glittering pale pubescence, the apical segment widely emarginate.

Hab. Singapore.

Gen. CHRYSIS, *Linn.*

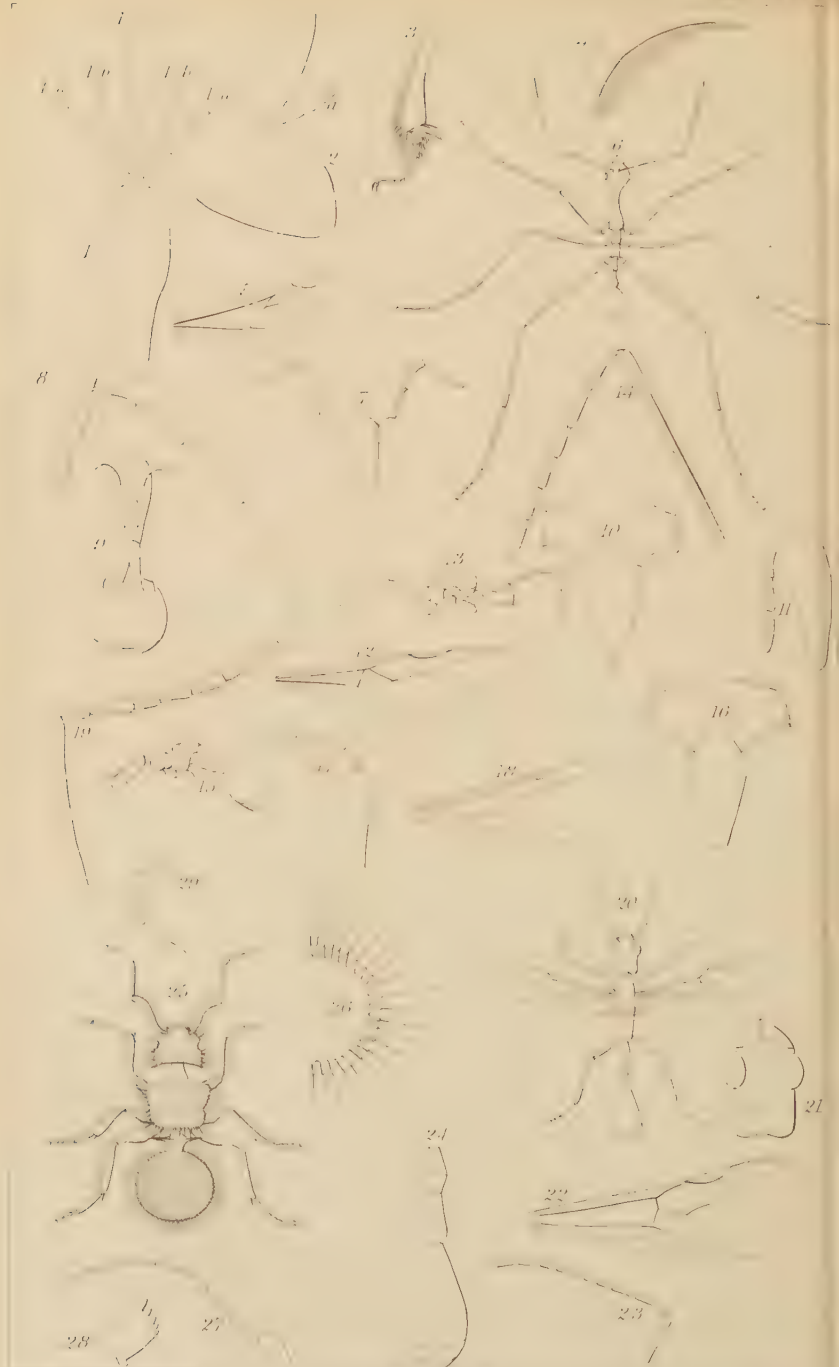
2. CHRYSIS MALACHITICA. *C. crassissime punctata viridi-cyanea*, thorace viridi-aureo, alis fusco-hyalinis, abdominis segmentis apicalibus dentibus sex armatis.

Length $4\frac{1}{2}$ lines. Metallic green, splashed with gold on the thorax and sides of the abdomen; the flagellum, mandibles, and tarsi black; the hinder margin of the vertex tinged with blue. The disk of the thorax blue; the tegulæ and nervures of the wings with a purple tinge; the wings subhyaline and iridescent; the lateral posterior angles of the metathorax acute; the post-scutellum produced, the apex truncate. Abdomen: more finely punctured than the head and thorax, but most strongly so at the base; the basal margin with a deep excavation on each side, the lateral angles somewhat produced and obtuse; the basal margin of the second segment blue; the apical margin of the third segment armed with six acute teeth.

Hab. Borneo (Sarawak).

3. CHRYSIS VESTIGATOR. *C. viridis nitens purpureo variegata*, punctatissima, abdominis segmentis margine basali nigro-æneis, ano tridenticulato.

Length $3\frac{3}{4}$ lines. Green, with shades and spots of deep blue; the tarsi, flagellum and mandibles, black; the head and thorax coarsely and



deeply punctured, the abdomen more finely so; one or two of the basal joints of the flagellum green above; the region of the ocelli blue. Thorax: a transverse blue line in the middle of the prothorax; the mesothorax with an oblong-quadrate blue shape in the middle; the wings subhyaline with the nervures brown. The abdomen with a central longitudinal smooth line; the middle of the abdomen tinged with rich blue; the apex distinctly tridentate.

The valuable collection of *Hymenoptera* which I have described, and, by permission of the Society, have had the pleasure of laying before them, is the property of W. W. Saunders, Esq., Fellow of the Society, and is the most complete collection formed by Mr. Wallace. In addition to the interest attached to the description of new species, I have endeavoured to show the extent of the known geographical range of those already described. Of the family *Apidae*, forty-one species are enumerated, twenty-six of which are new. It is, however, to the *Formicidae* that the most valuable additions are made: of the eighty-five species collected, only seven have been previously described; ten are added to the *Mutillidae*, forty-one to the Fossorial group, and thirteen to the family *Vespidæ*. This enumeration will serve to give some idea of the valuable additions to science, resulting from the labours of Mr. Wallace, in collecting the insects of the Eastern Archipelago.

DESCRIPTION OF THE PLATES.

TAB. I.

Fig.

1. Tongue of *Ptenoplectra chalybea*. 1 a, labial palpi; 1 b, paraglossæ; 1 c, labium.
2. The maxilla of *Ptenoplectra chalybea*. 2 a, maxillary palpus.
3. The posterior leg of *Ptenoplectra*.
4. Calcar or spur on the posterior tibia of *Ptenoplectra*.
5. Anterior wing of *Ptenoplectra*.
6. *Myrmica longipes*, ♂.
7. The labial palpi of *Polyrhachis*.
8. Maxillary palpi of *Polyrhachis*.
9. Thorax and abdomen of *Polyrhachis bihamata*.
10. Labial palpi of *Heptacondylus*. 11. Maxillary palpi of the same.
12. Wing of the same. 13. Profile of the same. 14. Antennæ of the same.
15. Profile of *Physatta*. 16. Labial palpi of the same. 17. Maxillary palpi of the same. 18. Wing of the same. 19. Antennæ of the same.

Fig.

20. *Cerapachys oculatus*. 21. Head of the same. 22. Wing of the same.
 23. Antennæ of the same. 24. Abdomen of the same.
 25. *Echinopla melanarctos*. 26. Section of the abdomen of the same,
 showing the styles, or blunt spines, with hairs on their summits,
 which cover the abdomen above. 27. Maxillary palpus of the same.
 28. Mandible of the same. 29. Labial palpus of the same.

TAB. II.

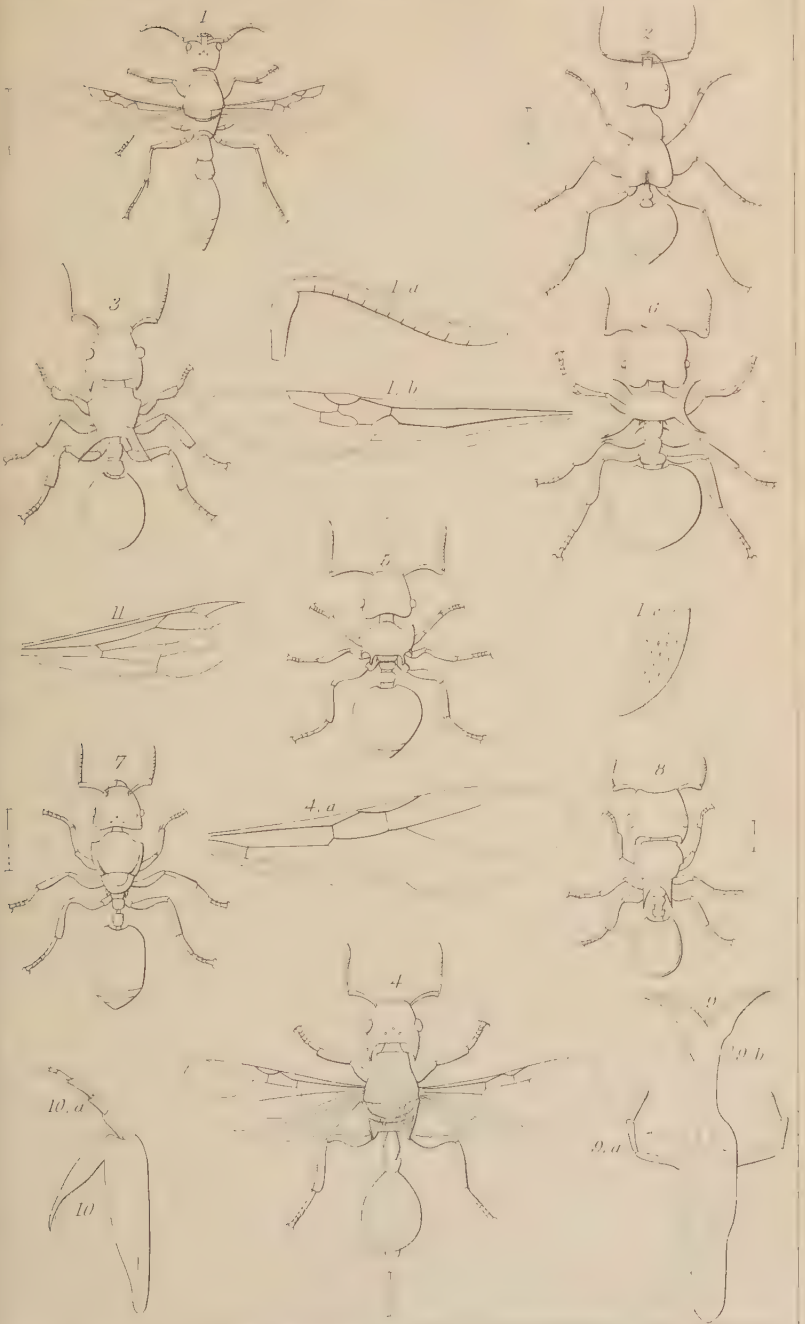
1. *Myrmosida paradoxa*. 1 *a*, antennæ; 1 *b*, wing.
2. *Crematogaster inflata*. 1 *b*, wing; 1 *c*, manble.
3. *Cataulacus horridus*.
4. *Cataulacus insularis*. 4 *a*, anterior wing.
5. *Meranoplus cordatus*. 6. *Meranoplus mucronatus*.
7. *Meranoplus castaneus*. 8. *Cataulacus reticulatus*.
9. Tongue of *Gayella pulchella*. 9 *a*, labial palpi; 9 *b*, paraglossæ. 10.
 Maxilla. 10 *a*, maxillary palpi.
11. Anterior wing of *Gayella pulchella*.

On the general Geographical Distribution of the Members of the
 Class AVES. By PHILIP LUTLEY SCLATER, Esq., M.A.,
 F.L.S.

[Read June 16th, 1857.]

AN important problem in Natural History, and one that has hitherto been too little agitated, is that of ascertaining the most natural primary divisions of the earth's surface, taking the amount of similarity or dissimilarity of organized life solely as our guide. It is a well-known and universally acknowledged fact that we can choose two portions of the globe of which the respective Faunæ and Floræ shall be so different, that we should not be far wrong in supposing them to have been the result of distinct creations. Assuming then that there are, or may be, more areas of creation than one, the question naturally arises, how many of them are there, and what are their respective extents and boundaries, or in other words, what are the most natural primary ontological divisions of the earth's surface?

In the Physical Atlases lately published, which have deservedly attracted no small share of attention on the part of the public, too little regard appears to have been paid to the fact that the divisions of the earth's surface usually employed are not always those



which are most natural when their respective Faunæ and Floræ are taken into consideration. The world is mapped out into so many portions, according to latitude and longitude, and an attempt is made to give the principal distinguishing characteristics of the Fauna and Flora of each of these divisions; but little or no attention is given to the fact that two or more of these geographical divisions may have much closer relations to each other than to any third, and, due regard being paid to the general aspect of their Zoology and Botany, only form one natural province or kingdom (as it may perhaps be termed), equivalent in value to that third. Thus in 'Johnston's Physical Atlas,' the earth is separated into sixteen provinces for Ornithology, solely according to latitude and longitude, and not after ascertainment of the amount of difference of ornithic life in the respective divisions. Six of these provinces are appropriated to America, one to Europe, and six to Asia, Australia, and the islands; a very erroneous division, according to my ideas, as I shall hereafter attempt to show. In Mr. Swainson's article in Murray's 'Encyclopedia of Geography,' and in Agassiz's introduction to Nott and Gliddon's 'Types of Mankind,' what I consider to be a much more philosophical view of this subject is taken. The latter author, in particular, attempts to show that the principal divisions of the earth's surface, taking zoology for our guide, correspond in number and extent with the areas occupied by what Messrs. Nott and Gliddon consider to be the principal varieties of mankind. The argument to be deduced from this theory, if it could be satisfactorily established, would of course be very adverse to the idea of the original unity of the human race, which is still strongly supported by many Ethnologists in this country. But I suppose few philosophical zoologists, who have paid attention to the general laws of the distribution of organic life, would now-a-days deny that, as a general rule, every species of animal must have been created within and over the geographic area which it now occupies. Such being the case, if it can be shown that the areas occupied by the primary varieties of mankind correspond with the primary zoological provinces of the globe, it would be an inevitable deduction, that these varieties of Man had their origin in the different parts of the world where they are now found, and the awkward necessity of supposing the introduction of the red man into America by Behring's Straits, and of colonizing Polynesia by stray pairs of Malays floating over the water like cocoa-nuts, and all similar hypotheses, would be avoided.

But the fact is, we require a far more extended knowledge

of zoology and botany than we as yet possess, before it can be told with certainty what *are* the primary ontological divisions of the globe. We want far more correct information concerning the families, genera, and species of created beings—their exact localities, and the geographical areas over which they extend—before very satisfactory conclusions can be arrived at on this point. In fact, not only families, genera, and species, but even local varieties must be fully worked out in order to accomplish the perfect solution of the problem. There is no reason, however, why attempts should not be made to solve the question, even from our present imperfect data, and I think the most likely way to make good progress in this direction, is for each inquirer to take up the subject with which he is best acquainted, and to work out what he conceives to be the most natural divisions of the earth's surface from that alone. Such being done, we shall see how far the results correspond, and on combining the whole, may possibly arrive at a correct solution of the problem—to find the primary ontological divisions of the earth's surface.

With these views, taking only the second group of the Order Vertebrata, the Class *Aves*, I shall attempt to point out what I consider to be the most natural division of the earth's surface into primary kingdoms or provinces, looking only to the geographical distribution of the families, genera, and species of this class of beings.

Birds, being of all the animated creation the class most particularly adapted for wide and rapid locomotion, would, at first sight, seem to be by no means a favourable part of Nature's subjects for the solution of such a problem. But, in fact, we know that there are many species, genera, and even families of this class, particularly amongst the *Passeres*, whose distribution is extremely local. The *Nestor productus*, confined to the little island called Philip Island; the several genera of Finches peculiar to the archipelago of the Galapagos; the gorgeous family *Paradisæidæ*, restricted to the Papuan territory, are familiar examples of this fact. Again, the migratory birds which traverse large districts of the earth's surface, how constant are they in returning only where they have been in former years! We do not find that the Nightingale extends its range farther to the west one year than another, nor that birds looked upon as occasional visitors to this country, grow more or less frequent. If the contrary be the case, it may always be accounted for by some external cause, generally referable to the agency of *man*, and not to any change in Na-

ture's unvarying laws of distribution. It is, however, amongst the *Passeres* that we find *endemism* most normal; the *Accipitres*, *Anseres*, and, more than all, the *Grallæ* are ever disposed to be *sporadic*, and indeed some species belonging to the latter order may be denominated truly cosmopolitan.

Taking then the birds of the order *Passeres* (which I consider ought properly to include the *Scansores* or *Zygodactyli*) as the chief materials from which to derive our deductions, let us suppose a species of this group, but of doubtful form and obscure plumage, to be placed before the Ornithologist, from whom its name is required. The first thing he looks to is, whether it is from the Old World or the New; and this is a point which, as a general rule, a mere glance at the external appearance of the object is sufficient to settle. The most obvious geographical division of the birds of this order certainly corresponds with the usually adopted primary division of the earth's surface. In fact, taking Ornithology as our guide, we may at once pronounce that the Faunæ of the Old and New worlds may, to all appearance, have been the subjects of different acts of creation. There are very many natural families which are quite peculiar to one or the other of these great divisions of the earth's surface, more subfamilies, few genera really common to the two, and very few, if any, species*.

The appended Table will show some of the most noticeable of the natural families of birds which are confined to the Old and New worlds respectively.

| Familiæ Neogeanæ, sive Novi Orbis. | | Familiæ Palæogeanæ, sive Orbis Veteris. | |
|---------------------------------------|----------------|--|--------------|
| Todidæ. | Tyrannidæ. | Coraciidæ. | Promeropidæ. |
| Momotidæ. | Cotingidæ. | Eurylæmidæ. | Muscicapidæ. |
| Bucconidæ. | Rhamphastidæ. | Meropidæ. | Musophagidæ. |
| Galbulidæ. | Opisthocomidæ. | Upupidæ. | Coliidæ. |
| Trochilidæ. | Cracidæ. | Bucerotidæ. | Megapodidæ. |
| Icteridæ. | Tinamidæ. | Sturnidæ. | Pteroclidæ. |
| Cærebidæ. | Meleagrinæ. | Paradiseidæ. | Phasianidæ. |
| Formicariidæ. | Odontophorinæ. | Meliphagidæ. | Perdicinæ. |
| Dendrocolaptidæ. | | | |

With regard to the genera of *Passeres*, common to the two worlds, when we have excepted the truly cosmopolitan forms *Turdus*, *Hirundo*, *Picus*, &c., the number will be found very small; and it will be observed that these are invariably genera

* There are now acknowledged only 8 species of the order *Passeres*, in

belonging to temperate regions, and such as extend themselves only through the northern portion of the New World, failing entirely before we reach Tropical and Southern America, the most really characteristic region of Neogean Ornithology.

Such is the case in the genera *Sitta*, *Certhia*, *Regulus*, *Parus*, *Lanius*, *Perisoreus*, *Pica*, *Corvus* and *Loxia*. No member of these genera (which are common to the temperate portions of both hemispheres) extends farther south in the New World than the Table-land of Mexico. They are all quite foreign to Neotropical (Tropical American) Ornithology, although in the Old World most of them reach the tropics.

Having, therefore, made our first territorial division that of the two worlds, agreeing so far with geographers, we will look at the great continent and Australia *en masse*, and see what are its most natural subdivisions.

Here we find ourselves at once at issue with ordinary geographers. Europe may be a very good continent of itself, in many ways, and in some respects worth all the rest of the world put together,—“*Better fifty years of Europe than a cycle of Cathay*,” says the Poet,—but it is certainly *not* entitled to rank as one of the primary zoological regions of the earth’s surface, any more than as one of the physical divisions. Europe and Northern Asia are in fact quite inseparable. So far as we are acquainted with the ornithology of Japan—the eastern extremity of the temperate portion of the great continent, we there find no striking differences from the European *Avi-fauna*, but rather repetitions of our best-known European birds in slightly altered plumage,—representatives in fact of the European types. Temminck, indeed, has stated, that there are no less than 114 birds found in Japan, identical with European species. Some of these, however, have been since ascertained to be apparently distinct, but there can be no question as to the general strong resemblance of the Japanese *Avi-fauna* to that of Europe. How far south we are to extend the boundaries of this great temperate region of the Old World can

which no differences have, as yet, been detected in: the comparison of specimens from the Old and New worlds, viz.:—

| | |
|--------------------------|----------------------------------|
| <i>Cotyle riparia</i> . | <i>Linota linaria</i> . |
| <i>Ampelis garrula</i> . | <i>Plectrophanes nivalis</i> . |
| <i>Junco hyemalis</i> . | <i>Plectrophanes lapponica</i> . |
| <i>Linota borealis</i> . | <i>Loxia leucoptera</i> . |

The whole of these (with exception of *Cotyle riparia*) range to the extreme north, where the two worlds almost unite.

hardly be fairly ascertained, until the ornithology of Central Asia is much better worked out than is at present the case. While among the birds of the Himalayas we find many striking instances of the recurrence of European types, there is no doubt that the ornithology of the Indian Peninsula and the rest of Southern Asia, below the 30th parallel, is quite different from it.

Africa, north of the Atlas, along the southern shores of the Mediterranean, again appears to belong to Europe zoologically, and not to the continent to which it is physically joined. Such species of birds, foreign to Europe, as are found in Algeria and Morocco, are not usually connected with true African forms, but are again slightly modified representatives of Europæo-Asiatic species.

Such are the N. African species.

Garrulus cervicalis.
Pica mauritanica.
Fringilla spodiogenia.
Parus ultramarinus.
Picus numidicus.

Representatives of the European.

Garrulus cristatus.
Pica caudata.
Fringilla cælebs.
Parus cæruleus.
Picus major.

On the whole, therefore, I think we may consider Africa, north of the Atlas, Europe and Northern Asia, to form one primary zoological division of the earth's surface, for which the name Palæarctic or Northern Palæogean Region would be best applicable.

The great continent of Africa will form a second well-marked division, after cutting off the slice north of the Atlas, but including Madagascar (where the African type appears to have reached the height of its peculiar development) and Western Arabia, to the Persian Gulf; for in this latter region, so far as our information goes, the African type seems to predominate over the Indian. Although there are genera of *Passeres* common to Africa and India, and even a few species, yet there can be no question as to the generally dissimilar character of the *Avi-faunæ* of these two countries. This second African division may be called the Æthiopian or Western Palæotropical Region.

Another tropical region of the Old World seems to be constituted by Southern Asia and the islands of the Indian Archipelago. The Philippines, Borneo, Java, and Sumatra, certainly belong to this division, but it is of course not yet possible to decide where the line runs which divides the *Indian* zoology from the Australian. New Guinea presents probably only a more exaggerated produc-

tion of the Australian type, and I should be inclined for the present not to separate New Zealand and the Pacific Islands generally from the Australian division. We should have, therefore, in the Old World one temperate region and three tropical; the eastern palæotropical or Australian advancing rather farther to the south than the others, the Indian or middle palæotropical being the most northern of the three.

In the New World we can simply divide the continent into northern and southern divisions; the northern, or Nearctic region, extending down the centre of the table-land of Mexico, and showing some indication of parallelism to the Palæarctic by the presence of certain temperate types; the Neotropical or southern (which embraces the whole of the rest of this great continent) being wholly free from any admixture of the sort, and in fact exhibiting, in my opinion (with the exception possibly of New Guinea), by far the richest and most peculiar *Avi-fauna* of the world's surface.

Having thus pointed out what I consider to be the primary divisions of the earth,—taking ornithology as our guide, I propose to devote a few lines to each region separately, noticing its apparent limits, its peculiarities, and most characteristic forms, and attempting to give an approximate estimate of the comparative abundance of ornithic species within its area.

The subjoined plan will serve to give at one view an illustration of my ideas as to the arrangement of these primary *Avi-faunæ* of the earth's surface. It must, however, be recollected that the calculations made as to the number of species to a square mile, can be only looked upon as mere attempts at approximations. Even in the whole general calculation, the presence of two variable elements—in the first place the number of square miles (about which geographers still give the most conflicting statements), and in the second place, the number of species of birds, concerning which ornithologists are as yet by no means agreed, greatly increases the uncertainty of the ratio deducible from them; and in working out the ratios in the respective regions, it is of course still more difficult to attain to any great degree of accuracy.

Taking however the whole number of square miles of dry land at 45,000,000, and the number of species of birds at 7500, which are both of them moderate estimates, we have on the average a single species to each 6000 square miles. In the different regions we shall attempt to show how far this ratio is departed from.

The zoological kingdoms or primary divisions are of course naturally separable into secondary divisions or provinces, but it would

be extending the limits of this communication too far to attempt to go into these at the present time.

I. PALÆARCTIC REGION (*Regio Palæarctica*).

Extent.—Africa north of the Atlas, Europe, Asia Minor, Persia and Asia generally north of the Himalaya range, upper part of the Himalaya range?, northern China, Japan and the Aleutian Islands. Approximate area of 14,000,000 square miles.

Characteristic forms.—*Sylvia*, *Luscinia*, *Erythacus*, *Accentor*, *Regulus*, *Podoces*, *Fregilus*, *Garrulus*, *Emberiza*, *Coccothraustes*, *Tetrao*.

It cannot be denied that the ornithology of the Palæarctic or great temperate region of the Old World is more easily characterized by what it has not than by what it has. There are certainly few among the groups of birds occurring in this Region, which do not develop themselves to a greater extent elsewhere. For we must acknowledge that the most productive seats of animal life, where all the bizarre and extraordinary forms that the Naturalist best loves are met with, lie under the suns of the tropics, and far removed from temperate latitudes. The most prevalent forms among the *Passeres*, of the Palæarctic Region, are perhaps the plain dull-coloured *Sylviinæ*, distinguished rather for their melodious song than by any external beauty of plumage or singularity of form. Upwards of 35 species of this subfamily occur in the ornithology of Europe alone; and when Northern Africa and the whole North of Asia are taken into calculation, the number would be considerably increased, and this Region may be considered the true focus of the group.

The genus *Erythacus* would be perhaps as good a representative genus as any as a type of Palæarctic ornithology; a second species (*Erythacus akahige*) occurring at the eastern extremity of the Asiatic continent, and there beautifully representing our common Robin. True *Emberiza* is likewise very characteristic of the temperate portion of the Old World, nearly the whole of the known species being found in Europe or Northern Asia. *Accentor* is perhaps more strictly a northern Himalayan form, with several representatives within the Palæarctic Region; but *Fregilus*, *Podoces*, *Garrulus*, *Tetrao*, and numerous species of *Anatidæ* are likewise eminently noticeable as among the most typical forms of Palæarctic ornithology.

The most recent summary of the Birds of Europe gives—

| | | |
|---------------------|-----|----------------|
| 1. Accipitres..... | 57 | } 581 species. |
| 2. Passeres | 238 | |
| 3. Scansores..... | 12 | |
| 4. Columbæ | 7 | |
| 5. Gallinæ..... | 22 | |
| 6. Struthiones | 0 | |
| 7. Grallæ | 101 | |
| 8. Anseres..... | 144 | |

It is very difficult to say what additions should be made to this in order to give the approximate number of the birds of the whole Palæarctic Region; but a moderate calculation does not show more than 650 species truly belonging to this fauna: for it must be recollected that the number 581 contains many birds of rare occurrence in Europe, and which must be correctly reckoned as belonging to other divisions. As we have in the Palæarctic Region the enormous land area of probably upwards of 14,000,000 square miles, this will give us a species for each 21,000 square miles, speaking in round numbers; and it consequently follows (as might have been expected), that the Palæarctic is by far the least prolific region of ornithic life on the globe. According to my ideas, therefore, the statement in Johnston's 'Physical Atlas,' that "*Europe possesses more species than any other zoological province*," is exactly contrary to the fact.

II. ÆTHIOPIAN OR WESTERN PALÆOTROPICAL REGION (*Regio Æthiopica*).

Extent.—Africa, south of the Atlas range, Madagascar, Bourbon, Mauritius, Socotra and probably Arabia up to the Persian Gulf, south of 30° N. l.; an approximate area of 12,000,000 square miles.

Characteristic forms.—*Gypogeranus*, *Helotarsus*, *Polyboroides*, *Gypohierax*, *Melierax*, *Macrodipteryx*, *Irrisor*, *Fregilupus*, *Bucorvus*, *Apaloderma*, *Parisoma*, *Macronyx*, *Lioptilus*, *Sericolius*, *Malaconotus*, *Laniarius*, *Chaunonotus*, *Prionops*, *Sigmodus*, *Phyllastrephus*, *Lanioturdus*, *Vidua*, *Juida*, *Buphaga*, *Verreauxia*, *Læmodon*, *Indicator*, *Musophaga*, *Colius*, *Pæocephalus*, *Numida*, *Phasidus*, *Struthio*, *Balæniceps*, *Scopus*.

(Madagascar). *Euryceros*, *Falculia*, *Oriolia*, *Philipitta*, *Brachypteracias*, *Atelornis*, *Bernieria*, *Hartlaubius*, *Artamia*, *Vanga*, *Coua*, *Leptosomus*, *Vigorsia*, *Mesites*, *Biensis*.

The characteristic forms of African Ornithology are very nume-

rous. Several groups of birds, which seem clearly entitled to rank as distinct families, or at least as subfamilies, are wholly peculiar to this region, such as the *Coliidae*, *Musophagidae*, and *Buphaginæ*. There are also very many genera, of which the species are all confined to this continent; the principal of which I have enumerated in my List of Typical forms. The island of Madagascar, however, is the locality where the African type seems pushed to its utmost degree of development. There are many genera quite peculiar to this island, or which have a single representative or so upon the adjacent coast of the continent. Such are *Oriolia*, *Atelornis*, *Brachypteracias*, *Vanga*, and others which I have mentioned above, not to mention the extinct gigantic *Æpyornis*. Bourbon, Mauritius and the other Mascarene islands all belong to Africa zoologically, and have only recently lost the now extinct birds of the genera *Didus*, *Pezophaps* and their allies, which were, so far as we know, types quite peculiar to this locality.

Dr. G. Hartlaub's lately published *System der Ornithologie West-Africa's* gives as inhabitants of that part of the continent,—

| | | |
|-------------------|-----|--------|
| Accipitres | 56 | } 753. |
| Passeres | 450 | |
| Scansores | 69 | |
| Columbæ | 17 | |
| Gallinæ | 19 | |
| Struthiones | 1 | |
| Grallæ | 99 | |
| Anseres | 42 | |

In the preface to Dr. Hartlaub's work will be found a *resumé* of all the most important facts known concerning African Ornithology.

For North-eastern Africa we have a List lately published by Dr. Heuglin, who mentions—

| | | |
|---------------------|-----|----------------|
| 1. Accipitres..... | 95 | } 754 species. |
| 2. Passeres | 372 | |
| 3. Scansores..... | 38 | |
| 4. Columbæ..... | 14 | |
| 5. Gallinæ | 24 | |
| 6. Struthiones | 1 | |
| 7. Grallæ | 130 | |
| 8. Anseres | 80 | |

A correct catalogue of the Birds of S. Africa would probably be not less numerous in species.

On the whole, therefore, I think we cannot allow for the Western Palæotropical region less than 1250 species, which, with an area of 12,000,000 square miles, gives one species to each 9600 square miles nearly.

III. INDIAN OR MIDDLE PALÆOTROPICAL REGION (*Regio Indica*).

Extent.—India and Asia generally south of Himalayas, Ceylon, Burmah, Malacca and Southern China, Philippines, Borneo, Java, Sumatra and adjacent islands; an area of perhaps 4,000,000 square miles.

Characteristic forms.—*Harpactes*, *Colocalia*, *Calyptomena*, *Eurylæmus*, *Buceros*, *Garrulax*, *Liothrix*, *Malacocercus*, *Pitta*, *Timalia*, *Pycnonotus*, *Phyllornis*, *Pericrocotus*, *Analcipus*, *Acridotheres*, *Gracula*, *Sasia*, *Megalæma*, *Phœnicophaus*, *Dasylophus*, *Palæornis*, *Pavo*, *Cerionis*, *Polyplectron*, *Argus*, *Euplocamus*, *Rollulus*, *Casuaris*.

Mr. Swainson, in his article in H. Murray's 'Encyclopedia of Geography,' considers the mainland of Southern Asia and the larger Indian islands as belonging to two different zoological regions. But it is now generally acknowledged that this is not the case. There are so many generic forms which commence in Southern Asia and extend over the greater part of the Indian Archipelago, that it is not possible to look upon these countries as belonging to different regions, though they doubtless form distinct subkingdoms or provinces, in each of which will be found corresponding representative species. How far in an eastern direction we are to extend the boundaries of the Middle Palæotropical Region is a difficult question, which can hardly be answered until we know more of the Natural History of these great islands; but there is no doubt that Borneo, Sumatra and Java belong to this zoology, but probably not Celebes.

The most characteristic forms of the Indian region are without doubt the *Phasianidæ*, the whole of which magnificent group of birds may be said to be confined to this region,—one or two species only straying into the confines of Palæarctic zoology, and a single genus, *Meleagris*, representing them in America, and the few birds of the genera *Numida*, *Agelastus* and *Phasidus* in Africa.

If the number of species duly attributable to the Middle Palæo-

tropical Region, be reckoned at about 1500, and its geographical area at nearly 4,000,000 square miles, we have a species to each 2600 miles nearly, which indicates a degree of intensity of species only surpassed by Tropical America.

IV. AUSTRALIAN OR WESTERN PALEOTROPICAL REGION (*Regio Australiana*).

Extent.—Papua and adjacent islands, Australia, Tasmania and Pacific Islands ; an area of perhaps 3,000,000 square miles.

Characteristic forms.—

1. (Australia.) *Ægotheles*, *Falcunculus*, *Colluricincla*, *Grallina*, *Gymnorhina*, *Strepera*, *Cinclosoma*, *Menura*, *Psophodes*, *Malurus*, *Sericornis*, *Epthianura*, *Pardalotus*, *Chlamydera*, *Ptilonorhynchus*, *Struthidea*, *Licmetis*, *Calyptorhynchus*, *Platycercus*, *Euphema*, *Calopsitta*, *Climacteris*, *Scythrops*, *Myzantha*, *Talegalla*, *Leipoa*, *Pedionomus*, *Dromaius*, *Cladorhynchus*, *Tribonyx*, *Cereopsis*, *Anseranas*, *Biziura*.

2. (Papua.) *Sericulus*, *Melanopyrrhus*, *Ptiladela*, *Edoliosoma*, *Peltops*, *Rectes*, *Manucodia*, *Gymnocorvus*, *Astrapia*, *Paradisea*, *Epimachus*, *Nasiterna*, *Charmosyna*, *Cyclopsitta*, *Goura*, &c.

3. (New Zealand.) *Neomorpha*, *Prosthemadera*, *Anthornis*, *Acanthisitta*, *Mohoa*, *Certhiparus*, *Turnagra*, *Aplonis*, *Creadion*, *Nestor*, *Strigops*, *Apteryx*, *Ocydromus*.

4. (Pacific Islands.) *Moho*, *Hemignathus*, *Drepanis*, *Pomarea*, *Metabolus*, *Sturnoides*, *Leptornis*, *Tutare*, *Loxops*, *Coriphilus*, *Ptilonopus*.

New Guinea is in some respects so peculiar in its Ornithology, as far as we are acquainted with it, that it would at first sight appear as if it ought to form a zoological region of itself. But there are certainly many genera common to it and Australia (for example, *Podargus*, *Tanysiptera*, *Alcyone*, *Mimeta*, *Ptilorhis*, *Cracticus*, *Manucodia*, &c.) ; and for the present I am inclined to retain it as part of the Australian region. Both New Zealand and the Pacific islands have also some claims to stand alone as separate regions, their forms of ornithic life being in many cases extremely peculiar and local. If they can be attached anywhere, however, it is to Australia ; and I have included them temporarily in the same region. Mr. Gould's 'Birds of Australia' has made us

well acquainted with the ornithology of that continent; but there still remains New Guinea and the multitudinous adjacent islands, which doubtless contain numbers of species as yet unknown to science. Mr. Gould, in his 'Birds of Australia,' enumerates—

| | | |
|---------------------|-----|--------|
| 1. Accipitres..... | 36 | } 600. |
| 2. Passeres | 311 | |
| 3. Scansores..... | 36 | |
| 4. Columbæ | 23 | |
| 5. Gallinæ..... | 16 | |
| 6. Struthiones | 1 | |
| 7. Grallæ | 78 | |
| 8. Anseres | 99 | |

in all 600 species.

The most characteristic forms of this region are perhaps the *Paradiseidæ* and *Epimachidæ* (both peculiar to it); the *Meliphagidæ*, one or two genera only of which are found externally, and of which between 60 and 70 species occur in Australia alone; the genera *Calyptorhynchus*, *Microglossa*, *Trichoglossus*, *Platycercus*, *Nestor*, *Strigops*, and many other forms amongst the *Psittacidæ*, besides a vast number of others.

Taking 3,000,000 of square miles as the amount of dry land in this region, and allowing 1000 species as peculiar to it, we have one species to every 3000 square miles, showing us that this is little inferior to the middle Palæotropical Region in intensity of species.

V. NEARCTIC OR NORTH-AMERICAN REGION (*Regio Nearctica*).

Extent.—Greenland and North America down to centre of Mexico—area of perhaps 6,500,000 square miles.

Characteristic forms.—*Trochilus*, *Sialia*, *Toxostoma*, *Icteria*, *Vireo*, *Mniotiltina*, *Chamaea*, *Certhia*, *Sitta*, *Neocorys*, *Calamospiza*, *Zonotrichia*, *Picicorvus*, *Gymnocitta*, *Meleagris*.

As is the case in the Old World, most of the genera belonging to the northern part of the New World are better represented in its tropical than in its temperate portions. Northern America, however, produces *Sylvicolæ* and *Zonotrichiæ* in much greater abundance than southern America, and these genera (which are analogous to the *Sylviinæ* and *Emberizæ* of the Old World) are perhaps its most ordinary characteristic forms. I have already

mentioned the chief genera common to the northern portions of both hemispheres. These are also characteristic of *Nearctic* in contrast to Neotropical zoology, as none of them extend into Southern America. The ornithology of the U. S. of America (which now embrace a very large proportion of the Nearctic region) contains upwards of 620 species.

Calculating the area of the Nearctic Region at six millions and a half of square miles, and the species peculiar to it at 660, we have about 9000 miles for each species, making this region, as might have been supposed, the least productive of ornithic life, after the Palæarctic.

VI. NEOTROPICAL OR SOUTH-AMERICAN REGION (*Regio Neotropica*).

Extent.—West India Islands, Southern Mexico, Central America and whole of S. America, Galapagos Islands, Falkland Islands. Estimated area of about 5,500,000 square miles.

Characteristic forms.—1. (Continental.) *Sarcorhamphus*, *Ibycter*, *Milvago*, *Thrasaëtus*, *Cymindis*, *Herpetotheres*, *Steatornis*, *Nyctibius*, *Hydropsalis*, *Eleothreptus*, *Trogon*, *Bucco*, *Monasa*, *Galbula*, *Furnarius*, *Synallaxis*, *Anabates*, *Oxyrhamphus*, *Dendrocolaptes*, *Pteroptochos*, *Rhamphocænus*, *Campylorhynchus*, *Hylophilus*, *Lessonia*, *Agriornis*, *Formicarius*, *Formicivora*, *Grallaria*, *Tenioptera*, *Tityra*, *Conopophaga*, *Pipra*, *Rupicola*, *Phænicercus*, *Cotinga*, *Gymnoderus*, *Cephalopterus*, *Vireolanius*, *Cyclorhis*, *Thamnophilus*, *Tanagra*, *Calliste*, *Saltator*, *Euphonia*, *Catamblyrhynchus*, *Phytotoma*, *Opisthocomus*, *Ramphastos*, *Picumnus*, *Celeus*, *Crotophaga*, *Cultrides*, *Penelope*, *Oreophasis*, *Crax*, *Thinocorus*, *Tinamus*, *Psophia*, *Cariama*, *Eurypyga*, *Parra*, *Palamedea*, *Chauna*, *Aramus*, *Merganetta*, *Heliornis*.

2. (Antilles.) *Todus*, *Priotelus*, *Cinlocerthia*, *Dulus*, *Loxigilla*, *Phænicophilus*, *Spindalis*, *Glossiptila*, *Teretristis*, *Saurothera*.

3. (Galapagos.) *Certhidea*, *Cactornis*, *Camarhynchus*, *Geospiza*.

There can be no question, I think, that South America is the most peculiar of all the primary regions in the globe as to its ornithology. There are at least eight or nine distinct families of birds which are quite confined to this country, many of these embracing a multitude of different genera and species. The *Trochilidæ* (which are the distinguishing family of the new world *par excellence*) are now known to be more than 320 in number, and

nearly the whole of them belong to tropical America, a few species only ranging into the northern portions of that continent. It is of course quite impossible to ascertain exactly the boundary between the northern and southern zoological regions of the New World; but many of the peculiar forms of the southern division appear to extend some way up the coast-line of Southern Mexico, even north of the isthmus of Tehuantepec; whilst northern forms range down the table-land quite into the Southern States of the Mexican Union. Thus we find one or two representatives of all the most characteristic South American groups occurring to the north of Panama,—*Galbula melanogenia* representing the *Galbulidæ*; *Pipra mentalis* and *Manacus Candæi*, the *Piprinæ*; *Calliste larvata*, the genus *Calliste*; *Cotinga amabilis*, the *Cotingæ*, and so on.

The Antilles seem to be a kind of debateable ground between the two regions, but are more properly referable, I suppose, or at least the greater portion of them, to the southern region. They furnish us, however, with several peculiar genera which do not occur elsewhere.

The Neotropical Region is without doubt, I think, rich in number of species beyond any other. A calculation which I made some short time ago of species occurring southwards of Panama gave me—

| | | |
|----------------|------|-----------------|
| 1. Accipitres | 95 | } 2000 species; |
| 2. Passeres | 1360 | |
| 3. Scansores | 230 | |
| 4. Columbæ | 25 | |
| 5. Gallinæ | 80 | |
| 6. Struthiones | 2 | |
| 7. Grallæ | 128 | |
| 8. Anseres | 80 | |

and I am decidedly of opinion that, what with taking recent additions into consideration and adding on Central America, we cannot estimate the number of birds belonging to this region at less than 2250. Taking the approximate area at $5\frac{1}{2}$ millions of square miles, this will give a species to each 2400 square miles. It follows, therefore, that this region is more richly endowed with ornithic species than any other portion of the globe.

SCHEMA AVIUM DISTRIBUTIONIS GEOGRAPHICÆ.

CREATIO NEOGEANA

Sive Orbis novi.
12,000,000 square miles, } $= \frac{1}{4,000}$.
3,000 species,

ORBIS TERRARUM.

45,000,000 square miles, } $= \frac{1}{6,000}$.
7,500 species,

CREATIO PALÆOGEANA

Sive Orbis antiqui.
33,000,000 square miles, } $= \frac{1}{7,300}$.
4,500 species,

V.

Regio Nearctica

Sive Boreali-Americana.
6,500,000 square miles,
660 species,

$$= \frac{1}{9,000}.$$

I.

Regio Palaearctica

Sive Palæogeana Borealis.
14,000,000 square miles,
650 species,

$$= \frac{1}{21,000}.$$

VI.

Regio Neotropica

Sive Meridionali-Americana.
5,500,000 square miles,
2,250 species,

$$= \frac{1}{2,400}.$$

II.

Regio Æthiopica

Sive Palæotropica Hesperica.
12,000,000 square miles,
1,250 species,

$$= \frac{1}{9,600}.$$

III.

Regio Indica

Sive Palæotropica Media.
4,000,000 square miles,
1,500 species,

$$= \frac{1}{2,600}.$$

IV.

Regio Australiana

Sive Palæotropica Eoa.
3,000,000 square miles,
1,000 species,

$$= \frac{1}{3,000}.$$

Regio I. 620 species.

II. 1,200 "

III. 1,760 "

IV. 1,000 "

V. 570 "

VI. 2,350 "

Total 7,500 "

Note on the Occurrence of *Phyllosoma commune* on the Coast of Cornwall. By JONATHAN COUCH, F.L.S. &c.

[Read November 5, 1857.]

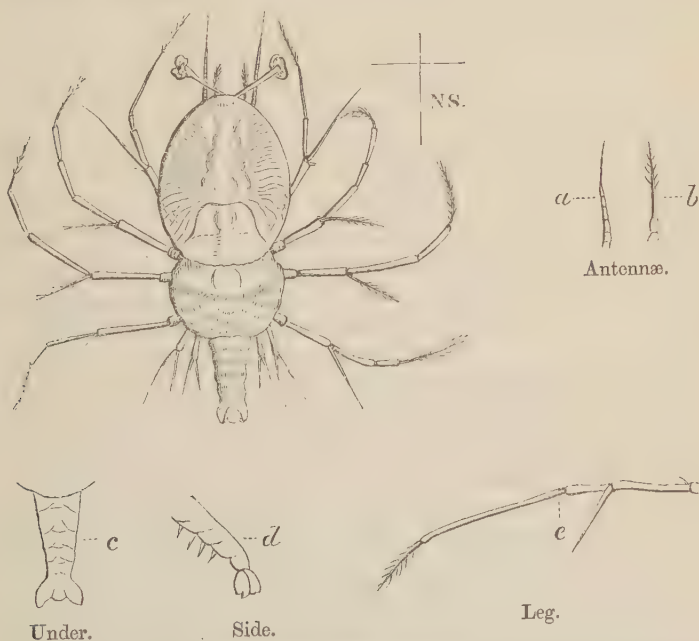
I HAVE the pleasure of communicating to the Linnean Society a notice of the occurrence of the *Phyllosoma commune* on the coast of Cornwall; and although, from an announcement in the Report of the Royal Cornwall Polytechnic Society for the year 1851, it appears that it has been taken once before in our waters, yet as no further remark is made concerning it by W. Cocks, Esq., who had noticed it, and no description or figure is to be found in our President's 'History of British Stalked Crustacea,' it is hoped that a representation of this creature, drawn from a British specimen, with such observations as I was able to make from an example newly taken, will be acceptable to the Society.

The specimen was captured near Polperro, in a pilchard drift-net, four leagues from land, at a depth of about three fathoms from the surface, on the 1st August, 1857. It attracted the particular notice of the fisherman from the sparkling brilliancy of its eyes, while the rest of its body was almost as transparent as glass. When brought on shore a few hours afterwards, it was able to exert some moderate degree of activity. It came into my possession about twenty-four hours after its death, and its immersion in a bottle of glycerine, the best fluid I am acquainted with for ensuring the preservation of many small subjects of natural history, which it effects without changing anything of their colour, and but little of their transparency.

This example is a little less than an inch in length, and of the form and proportions represented in the figure which accompanies this paper; but the sketch I have made is enlarged, that I might more readily represent the disposition of the parts. The body is very thin, or depressed; the border of the carapace egg-shaped, being broadest a little behind the middle of the length. The head is represented as distinct from the carapace (thorax, M. E.); but the separation is scarcely discernible. The eyes on long and slender footstalks, which are inserted together at one point, are erected divergently: the upper part of the eyestalk is enlarged, and the eye itself formed of two unequal portions, the anterior of which is the larger. The principal [external] antennæ wide apart, projecting beyond the eyes, with 3 joints, the lowest furnished with a fine spine. The internal antennæ [antennules] appearing between the footstalks of the eyes and the external antennæ, and

shorter than both; divided near the tip, and the (slightly) longer branch having a scarcely perceptible brush. Both pairs of antennæ are directed straight forward; but when alive, it is probable that, together with the eyes, they possess extensive motion.

The second or posterior carapace, called by Dr. Milne Edwards the thorax, is less than the former, but equally thin and transparent, and near its border carries the coxæ, or insertion of the proper legs. Posteriorly it has attached to it the abdomen, terminating in two long, bifid processes. I count 4 rings on the abdominal portion, and there are probably 5; under these are 4 oval plates, perhaps in pairs. Lateral plates of the tail, oval; the central less distinct and not quite so long: legs long, slender, four pair, bifurcate at the second joint; the posterior bifurcation scarcely longer than the second phalanx; the first and last pair having this part rather longer than the two intermediate ones. All of them (the principal branches and bifurcations) simple, pointed, clothed with hairs toward the end.



Phyllosoma commune, taken near Polperro, August 1, 1857, in a pilchard drift-net, four leagues from land and three fathoms from the surface.

The eyes are the only parts that can be said to possess colour,

the globe of the eye and a small part of the stalk supporting it being of a rich brown; but those who saw the animal alive informed me, that on the sides of the carapace were patches of the colour of silver, which, however, had vanished when it came to my hands.

At first nothing could be discerned of its interior organization, beyond some slight lines, which appeared to be nerves or blood-vessels, and which proceeded from the upper border of the thorax to the antennæ or eyes. But as the glycerine penetrated into its substance, the structure became visible without being obscure. Proceeding from the narrow longitudinal line, the whole breadth of the carapace presented an organization which I could not doubt was branchial. The organ on either side appeared to arise with 11 roots: the shortest, which were in front, were simple; but the greater number were bifurcate, and some had no less than four divisions, 22 in all. The four pairs of legs are inserted into the border of the thorax, and at the place of insertion the margin appears to possess a little angularity, and lines of greater density are seen passing off from the coxæ towards a place of meeting in the middle. Those I suppose to be muscles.

[MEMORANDUM.]

The species of *Phyllosoma* represented in the figure accompanying Mr. Couch's paper, appears to differ in one respect from the form described by M. Edwards under that name, in which the cephalic tergal plate is stated to be *less* than the thoracic. The diversity, however, may be due to difference of age or sex; and it is to be remarked, that Mr. Couch's figure corresponds very closely in this and other respects with that of *Phyllosoma commune* (Leach) given in Tuckey's 'Voyage to the River Zaire,' p. 417, Pl. 18. fig. 6.

The very recent researches of Dr. Gegenbaur (Siebold and Köl liker's Zeitsch. f. Wiss. Zoolog. Band v. p. 352; and Müller's Archiv, 1858, p. 43) have thrown much light upon the internal organization of *Phyllosoma*. From these it would appear to be placed beyond doubt, that the organs supposed by Mr. Couch to be internal *branchiæ*, are in reality, as suggested by M. M. Edwards (Hist. Nat. des Crustacées, t. ii. p. 475), the liver, and that the respiratory function is performed chiefly by the expanded external surface of the body, although special organs analogous to *branchiæ* exist in the form of feathered appendages to the feet.

For the detailed information concerning the nervous, circulatory and alimentary systems in *Phyllosoma*, reference should be made

to the latter of the two papers cited above. And it need here only, be remarked that in the condition of the circulatory system, this remarkable genus would appear to differ widely from the Stomapod type and very closely to resemble the Decapoda.— [G. B.]

On the Zoology of New Guinea.

By PHILIP LUTLEY SCLATER, M.A., F.L.S. &c.

[Received December 3, 1857. Read December 17, 1857.]

IN pointing out what appear to me to be the principal zoological divisions of the earth's surface (as I attempted to do in the course of the observations on the general geographical distribution of birds which I made before the Linnean Society last summer), it was not without some hesitation that I placed New Guinea in the same region as Australia. Since that time I have paid some attention to what is known of the zoology of this interesting country, and have had an opportunity of revisiting the museums of Paris and Leyden, where the best series of its animals are to be found. From what I have thus observed, and from the writings of the Dutch naturalists on the subject, I am now quite persuaded that, while Borneo, Java and Sumatra are inseparably allied to the South-Asiatic fauna, Amboyna, Timor, Gilolo, New Guinea and probably Celebes, with some of the other Eastern islands, are properly appertinent to the same primary zoological region as Australia. The straits of Macassar are perhaps the determining line separating these two regions, the island of Lombok (which lies due south of them) being (as Mr. Wallace's investigations have shown) in some respects debateable ground between them.

With the view of supplying materials towards a more perfect understanding of the distribution of organized life in these countries, I have drawn up the following summary of the mammalia and birds of New Guinea, as far as the scattered and scanty notices on this subject met with among the writings of different travellers and naturalists have enabled me to do so.

The first explorer of New Guinea who has left us any record of his scientific proceedings is Sonnerat, who during his celebrated voyage in the year 1771 collected a considerable number of plants and birds, principally on the island of Jobie in the Bay of Geelvink, of which he afterwards gave an account in his '*Voyage à la Nouvelle Guinée*,' published in Paris in 1776. Some of the species

figured by Sonnerat were provided with scientific names by Scopoli in the second part of his '*Deliciæ Faunæ et Floræ Insubricæ*' (fol. Ticini, 1786); and these authors are therefore our earliest authorities on Papuan ornithology.

In 1818 MM. Quoy and Gaimard, in the French discovery-ship '*Uranie*,' visited Guebé, Waigiu and Rawak, and in the "*Zoology*," of their voyage described three or four species of birds from these islands, but do not appear to have brought anything from the main coast of New Guinea.

The next era in the scientific exploration of this country is one of considerable importance. From the 26th of July to the 9th of August, 1824, the French discovery-ship '*Coquille*,' remained at anchor in a harbour in the north-eastern part of the Bay of Geelvink, named by the French "*Havre-Dorey*." The well-known naturalist Lesson was attached to this expedition, as also M. Garnot. During their twelve days' stay they procured, amongst other objects of natural history, about fifty species of birds, the greater part of which were quite new to science and were afterwards described by them in their joint work upon the zoology of the expedition. M. Lesson's other works, his '*Traité*' and '*Manuel d'Ornithologie*,' and '*Histoire des Paradisiens*,' &c., likewise contain many interesting notices arising from observations made during his sojourn on this spot.

Three years afterwards, in 1827, a second French discovery-ship, the *Astrolabe*, under the command of Dumont d'Urville, passed another twelve days in the same place. MM. Quoy and Gaimard, who were again the naturalists of this expedition, obtained, on this occasion, twelve additional novelties in ornithology, which they afterwards described and figured in the '*Zoology of the Voyage of the Astrolabe*.'

The next event to be recorded in the scientific history of Papua sprang from the energy of a different people. A few months after this, in the beginning of 1828, the Government of Holland sent the corvette '*Triton*' and schooner '*Iris*' from Batavia to found a settlement on the west coast of New Guinea. The expedition had on board a royal commissioner and several members of the scientific commission which was then engaged in the exploration of the Dutch possessions in the East Indies. They first explored the Dourga Strait on the southern coast, and thence returning northwards, discovered in the district called Lobo, what they described as a deep and spacious bay shut in by elevated land, and of a picturesque aspect. There they commenced their establish-

ment with the construction of a fort, and took formal possession on the 24th of August, 1828, of the whole coast in the name of the King of the Netherlands, with the usual solemnities. The bay was christened "Triton's Bay," and the strait leading to it, "Iris Strait," to commemorate the names of the two vessels. After several years' occupation, this settlement was eventually abandoned on account of the excessive unhealthiness of the locality; but MM. Müller and Macklot, the two scientific commissioners, were by no means idle during their stay there on the first foundation of the settlement, and it is to their industry that the Leyden Museum is indebted for the finest series of specimens of natural history from this wonderful country which is in existence. It is much to be regretted that no full account has ever been given to the public of these discoveries. In the magnificent work entitled, '*Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche bezittingen*,' in which the results of the labours of the scientific commission are reported, it is stated that 119 species of birds were obtained in New Guinea; but no complete catalogue is given of them. In fact, in the zoology of this work only monographs of one or two of the more noticeable genera of birds are contained; others are shortly characterized in the foot-notes attached to the volume which treats of the Ethnography, and is entitled '*Land en Volkenkunde*,' whilst a large remainder have as yet only received MS. names in the Leyden Museum, under which many of them are inserted in Prince Bonaparte's '*Conspectus*,' often even without any attempt at descriptive characters.

The recently published volume on the zoology of the '*Voyage au Pôle Sud*' (the plates of which were issued several years since), contains several novelties in Papuan ornithology, which were met with during the passage of the exploring vessels *Astrolabe* and *Zélée* along the southern and western coasts of New Guinea; and some scattered notices on the same subject also occur in the reports of one or two of the English expeditions.

From all these sources we are acquainted with about 170 species of birds inhabiting New Guinea; a number which, when we consider the large extent of its surface and the very small portion of it which has been scientifically explored, consisting only of two small isolated spots at its western extremity and parts of its southern coasts, we may calculate to represent perhaps not more than one-third of the species it really possesses. Of these species about 109 appear to be peculiar to New Guinea, that is, they have not hitherto been found

elsewhere; 14 are common to New Guinea and Australia; 35 occur in other of the Eastern islands besides New Guinea, and the remainder are birds of wide distribution. The true tendency of this ornithology is perhaps better manifested by the presence of certain genera, such as *Ptilotis*, *Entomophila*, *Tropidorhynchus*, *Mimeta*, *Cracticus*, *Ptilonorhynchus*, and *Geopelia*, which are highly characteristic of the fauna of Australia; and by the occurrence in Northern Australia of members of the Papuan genera *Tanysiptera*, *Manucodia*, *Ptilorhis* and *Microglossa*. On the other hand, the presence of species of *Buceros*, *Arachnothera*, *Eupetes* and *Corvus*, and of *Peltops* (a genus of *Eurylæmidæ*) in New Guinea, types which do not extend into Australia, serve to remind us that New Guinea is somewhat intermediate in the character of its fauna, as in its geographical position, between the Indian and Australian regions. Upwards of 20 generic forms appear, as far as we know, to be quite restricted to Papua and its adjacent islets, namely, *Melidora*, *Xanthomelus*, *Melanopyrrhus*, *Ptiladela*, *Edoliisoma*, *Peltops*, *Rectes*, *Gymnocorvus*, *Paradisea*, *Diphyllodes*, *Cicinnurus*, *Lophorina*, *Parotia*, *Seleucides*, *Epimachus*, *Paradigalla*, *Astrapia*, *Chamosyna*, *Nasiterna* and *Eutrygon*; but the propriety of the generic isolation of some of these types may be questioned by some naturalists. One very peculiar family, the *Paradiseidæ*, is quite confined to New Guinea and its adjacent islets. I have been particular in ascertaining what species of these remarkable birds have been really met with *alive* in the localities visited by naturalists. M. Lesson, it appears, procured *P. rubra* on the island of Waigiou, and *P. Papuana* and *Cicinnurus regius* at Havre-Dorey; MM. Müller and Macklot found at Triton's Bay only the two latter species. M. Lesson likewise met with *P. apoda* in the Aru islands, and Mr. Wallace, who has recently visited these islands, also found *P. apoda* and *Cicinnurus regius* living there. It is much to be hoped that this latter gentleman, who has so successfully commenced his explorations in the Eastern archipelago may carry them to an equally prosperous termination and widely extend our present imperfect knowledge of the zoology of these countries.

Again, New Guinea agrees with Australia in the absence of two families, the Wood-peckers (*Picidæ*) and Pheasants (*Phasianidæ*), both of which are very fully developed in the region of Indian zoology. It is also observable that hitherto no *Fringillidæ* appear to have been met with in New Guinea, although I have little doubt that, when the zoology is more fully explored, forms connected

with *Amadina*, *Poephila* and their allies, which are abundant on the northern coasts of New Holland, will be detected.

Thus far I have spoken only of the Birds of New Guinea, as of the Mammalia there is not much to say, except to call attention to the fact of its close intimacy with Australia in this respect. Out of the ten species of this class of beings hitherto observed in New Guinea, all, with the exception of the *Sus* and the Dugong of the coasts, belong to the *Marsupialia*, an order which is pre-eminently Australian. Of the genera to which these Marsupials are referred, two are peculiar to New Guinea, and one (*Cuscus*) belongs rather to the Moluccas; but the three others are characteristic Australian forms. The tables given in the zoological volume of the 'Verh. over de Nat. Gesch.' present us with a most instructive view of the general geographical distribution of the Mammalia in the great Eastern islands. In Sumatra, Borneo and Java we find the most highly organized *Quadrumanæ*, large Carnivores (*Felis* and *Ursus*), Pachyderms; in Sumatra even a peculiar species of Elephant*, Rhinoceroses and a multitude of the higher classes of Mammalia. What a contrast to this, when we cast our eye down the columns relating to Celebes, Amboyna, Timor and New Guinea! A single straggling *Cercopithecus* (in Celebes and Timor only) and two other *Quadrumanæ* (in Celebes), a single *Cervus*, an Antelope, a *Viverra* (sole representative of the Carnivora), with two or three *Suidæ*, constitute nearly the whole of the Placental Mammals found in these great islands, with the exception of Bats and Rodents. Here, as in Australia, the two latter Orders are found in company with the Marsupials, an additional piece of evidence to my mind of the correctness of Professor Owen's recent arrangement of these groups at the base of the Placental Mammalia: for the student of the geographical distribution of animals soon learns to appreciate the value of the old maxim "*noscitur a sociis*," quite as applicable in this sense to organized existences generally, as, taken in its usual meaning, to mankind.

The following is what I believe to be a tolerably perfect list of the Mammifers and Birds which have hitherto been positively recognized as having been met with in New Guinea and its adjacent islets. In every case I have added the precise locality in which each has been found, when that is ascertainable, and the authority for such locality. I have likewise generally noted the Museums in which examples of the species are contained, nearly all of

* *Elephas sumatranus*, Temminck, Coup d'œil sur les poss. Nederl. i. p. 328, et ii. p. 91; Bp. in P. Z. S. 1849, p. 144 (note).

which, thanks to the liberality of the Directors of these institutions, I have had the satisfaction of examining myself.

MAMMALIA.

1. *Sus papuensis*, Lesson.
Voy. Coq. Zool. i. p. 171, pl. 8. Havre-Dorey (*Less.*). Mus. Paris.
2. *Halichore australis*, Owen.
Jukes, Voy. Fly. ii. p. 323; Müll. Verh. Ethn. p. 21. Coasts of New Guinea (*Müll.*). Endeavour St., N. Australia (*Jukes*). Brit. Mus.
3. *Dorcopsis Brunii*, Schreber, sp.
Müll. Verh. Zool. Mamm. p. 131, p. 21. Mus. Ludg. et Brit.
4. *Dendrolagus ursinus*, Müll.
Verh. Zool. Mamm. p. 141, pl. 19. Mus. Brit. et Lugd.
5. *Dendrolagus inustus*, Müll.
Verh. Zool. Mamm. p. 143, pl. 20. Mus. Brit. et Lugd.
6. *Cuscus maculatus*, Desm., sp.
Voy. Coq. Zool. i. p. 156, pl. 5; Müll. Verh. Ethn. p. 20. Mus. Par. et Brit.
7. *Cuscus chrysorrhous*, Temm.
Phalangista chrysorrhous, Temm. Mon. Mamm. i. p. 12; Waterh. Mamm. i. p. 537. South-eastern coast of N. G. (*Jukes*). Mus. Lugd. et Brit.
8. *Belidea Ariel*, Gould?
P. Z. S. 1842, p. 11; Mamm. Austr. *Petaurus sciureus*, Müll. Verh. Ethn. p. 20.
The *Belidea* of New Guinea probably belongs to this North-Australian species, which is different from *B. sciurea* of N. S. Wales; see Waterh. Mamm. i. p. 337. Mus. Lugd. et Brit.
9. *Perameles doreyanus*, Q. & G.
Voy. Astr. Zool. i. p. 100, pl. 16. Havre-Dorey (Q. & G.). Mus. Paris.
10. *Phascogale melas*, Müll.
Verh. Ethn. p. 20. Lobo (*Müll.*). Mus. Lugd.

AVES.

FALCONIDÆ.

1. *Ichthyæetus leucogaster*, Gm., sp.
Gould, B. Austr. i. pl. 3. *Falco blagrus*, Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.
2. *Haliastur leucosternus*, Gould.
Gould, B. Austr. i. pl. 4. *Haliæetus girrenera*, Less. Voy. Coq. Zool. i. p. 615. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Par. et Lugd.
3. *Astur Novæ Hollandiæ*, Gm., sp.
Gould, B. Austr. i. pl. 14, 15; Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.

4. *Astur? longicaudus*, Garnot, sp.

Falco longicauda, Garnot, Voy. Coq. Zool. i. p. 588. Havre-Dorey (Garn.). Mus. Paris.

STRIGIDÆ.

5. *Spiloglaux humeralis*, H. & J.

Athene humeralis, H. & J., Voy. au P. S. Zool. iii. p. 53; Atlas, pl. 4. fig. 1; Bp. Consp. p. 40. Mus. Par.

6. *Spiloglaux theomacha*, Bp.

Bp. Compt. Rend. xli. p. (Oct. 22nd, 1855).

CAPRIMULGIDÆ.

7. *Podargus papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 207, pl. 13; Gould, B. Austr. Supp. pt. ii. pl. 7; Müll. Verh. Ethn. p. 21. Havre-Dorey (Q. & G.); P. Marianne's Straits and is. Aidoema (Müll.). Mus. Paris.

8. *Podargus ocellatus*, Q. & G.

Voy. Astr. Zool. i. p. 208, pl. 14. Havre-Dorey (Q. & G.). Mus. Par.

HIRUNDINIDÆ.

9. *Hirundo frontalis*, Q. & G.

Voy. Astr. i. p. 204, pl. 12, fig. 1. *H. neoxena*, Gould, B. Austr. ii. pl. 13? Havre-Dorey. Mus. Paris.

CYPSELIDÆ.

10. *Macropteryx mystaceus*, Less., sp.

Cypselus mystaceus, Less. Voy. Coq. Zool. i. p. 647, pl. 22. Havre-Dorey. Mus. Paris.

Specimens of this beautiful Swift in the Leyden Museum are from Amboyna.

CORACIIDÆ.

11. *Coracias papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 220, p. 16. Havre-Dorey. Mus. Paris.

This Roller is commonly identified with *Coracias Temmincki*, Vieill. (Le Vaill. Ois. de Par. Suppl. pl. G.), which is from Celebes. Specimens of the latter bird from that island are in the Leyden Museum, and Mr. Wallace has recently transmitted it from the vicinity of Macassar. The two species must be accurately examined and compared before their identity can be considered unquestionable.

ALCEDINIDÆ.

12. *Dacelo Gaudichaudi*, Q. & G.

Voy. Uranie, Ois. pl. 25. *Chouchalcyon gaudichaudi*, Less., Tr. d'Orn. i. p. 248; Müll. Verh. Ethn. p. 22. I. Waigiu (Q. & G.); Lobo (Müll.). Mus. Paris., Lugd. et Brit.

13. *Melidora macrorhina*, Less., sp.

Dacelo macrorhinus, Less. Voy. Coq. Zool. i. p. 692, pl. 31 *bis*, fig. 2.
Melidora Euphrosiæ, Less. Tr. d'Orn. p. 249. Havre-Dorey (*Less.*).
 Mus. Par.

14. *Halcyon albicilla*, Less.

Less. Tr. d'Orn. i. p. 247. *H. saurophaga*, Gould, Voy. Sulphur, Zool.
 p. 39, pl. 19. North coast of N. G. (*Hinds*). Mus. Lugd. et Brit.

15. *Halcyon cinnamomeus*, Sw.

Zool. Ill. ser. i. pl. 67; Less. Voy. Coq. Zool. i. p. 696. Havre-Dorey
 (*Less.*). Mus. Lugd.

16. *Halcyon Torotoro*, Less., sp.

Syma Torotoro, Less. Voy. Coq. Zool. i. p. 689, pl. 31 *bis*, fig. 1; Müll.
 Verh. Ethn. p. 22. *Halcyon flavirostris*, Gould, B. Austr. Suppl. pt. i.
 pl. 7?. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Paris. et Lugd.

17. *Tanysiptera Dea*, Linn., sp.

Less. Voy. Coq. Zool. i. p. 697; Müll. Verh. Ethn. p. 22. Havre-
 Dorey (*Less.*); Lobo (*Müll.*). Mus. Paris., Lugd. et Brit.

18. *Alcedo Meningting*, Horsf.

Linn. Trans. xiii. p. 172. *Ceyx Meningting*, Less. Voy. Coq. i. p. 691.
 Havre-Dorey (*Less.*).

Specimens of this bird in the Leyden Museum are from Java and Borneo.
 Lesson's authority for its occurrence in New Guinea is perhaps hardly
 trustworthy.

19. *Alcyone Lessoni*, Cassin.

Pr. Ac. Sc. Phil. 1850, p. 69. *Ceyx azurea*, Less. Voy. Coq. Zool. i.
 p. 690. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd. et Ac. Phil.

20. *Alcyone solitaria*, Temm., sp.

Pl. Col. 595, fig. 2; Müll. Verh. Ethn. p. 22. Lobo (*Müll.*).

21. *Alcyone pusilla*, Temm., sp.

Pl. Col. 595, fig. 3; Müll. Verh. Ethn. p. 22; Gould, B. Austr. ii. pl. 26.
 Lobo (*Müll.*); North Australia. Mus. Lugd.

BUCEROTIDÆ.

22. *Buceros ruficollis*, Vieill.

Temm. Pl. Col. 557; Müll. Verh. Zool. Aves, p. 24, et Ethn. p. 22.
B. plicatus, Less. Tr. d'Orn. i. p. 445. Lobo (*Müll.*); Havre-Dorey (*Less.*).
 Mus. Lugd.

According to Müller, this Hornbill is the only one which extends to New
 Guinea, being also found in Amboyna, Gilolo, Ceram, Rawak and Waigiou.
 It appears to have been confounded by Lesson with *Buceros plicatus*, a
 Javan species.

NECTARINIIDÆ.

23. *Nectarinia Eques*, Less.

Voy. Coq. Zool. i. p. 678. pl. 31, fig. 1; Man. d'Orn. pt. ii. p. 45. Havre-Dorey, and Havre d'Offack, Waigiou (*Less.*).

Specimens of this bird in the Leyden Museum are from Gilolo.

24. *Nectarinia Zenobia*, Less., sp.

Cinnerys Zenobia, Less. Voy. Coq. Zool. i. p. 679, pl. 30. fig. 3. *Cinn. clementiæ*, Less. Man. d'Orn. ii. p. 40. Havre-Dorey (*Less.*).

25. *Nectarinia aspasia*, Less., sp.

Cinn. Aspasia, Less. Voy. Coq. Zool. i. p. 677, pl. 30. fig. 4; Müll. Verh. Ethn. p. 22, et Zool. Aves, p. 58. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

26. *Arachnothera Novæ Guineæ*, Less., sp.

Cinnerys Novæ Guineæ, Less. Voy. Coq. Zool. i. p. 678; Müll. Verh. Zool. Aves, p. 70. pl. 11. fig. 3. Havre-Dorey (*Less.*); Lobo (*Müll.*).

27. *Dicæum pectorale*, Müll. & Schl.

Verh. Ethn. p. 162 (note). *D. erythrothorax*, Less. Voy. Coq. pl. 30. fig. 1 ? Lobo (*Müll.*). Mus. Lugd.

28. *Melanocharis nigra*, Less., sp.

Dicæum nigrum, Less. Voy. Coq. i. p. 673; Cent. Zool. pl. 27; Müll. Verh. Ethn. p. 162. Havre Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

Müller and Schlegel say this bird is not a *Dicæum*, but a Musciapine, allied to Boie's genus *Hylocharis* (since changed to *Hyloterpe*). It does not seem to me to be referable to either of these genera, but, as far as external appearances go, to be more nearly akin to *Dicæum* than *Hyloterpe*. I have therefore used for it the new generic term *Melanocharis* (*μέλας, niger, et χάρις, gratia*). There are examples of both sexes in the Leyden Museum.

MELIPHAGIDÆ.

29. *Ptilotis similis*, Puch.

H. & J. Voy. au P. S. Atlas, pl. 17; Zool. iii. p. 89.

30. *Ptilotis fumata*, Müll. MS.

R. Oetanata, N. G. (*Müll.*). Mus. Lugd.

31. *Ptilotis striolata*, Müll. MS.

R. Oetanata, N. G. (*Müll.*). Mus. Lugd.

32. *Ptilotis auriculata*, Müll. MS.

Lobo (*Müll.*). Mus. Lugd.

I was not aware, when I examined specimens of these three last species in the Leyden Museum, that they were undescribed, expecting to find them in the 'Verhandeligen,' &c., or I should have taken notes of them. It is not without reluctance that I insert them in my List, as I strongly disapprove of the practice of publishing MS. names without descriptions; but

in the present instance it is important to show the prevalence of this Australian generic form in New Guinea.

33. *Entomophila albigularis*, Gould.

B. Austr. iv. pl. 51. Lobo (Müll.). Mus. Lugd.

34. *Tropidorhynchus mitratus*, Müll. M.S.

T. corniculatus, Müll. Verh. Ethn. p. 21. West coast of New Guinea, R. Oetanata (Müll.). Mus. Lugd.

This is very likely to be the same species as has been lately figured by Mr. Gould as *T. buceroides*, Suppl. B. Austr. pt. ii. pl. 17, in which case it ought to bear that name.

35. *Tropidorhynchus chrysotis*, Less., sp.

Philedon chrysotis, Less. Voy. Coq. Zool. i. p. 645, pl. 21 bis. *Myzantha flaviventer*, Less. Man. d'Orn. ii. p. 67. Havre-Dorey (Less.); R. Oetanata (Müll.). Mus. Lugd.

36. *Tropidorhynchus Novæ Guineæ*, Müll. & Schl.

Verh. Ethn. p. 153. West coast of N. G. (Müll.).

TURDIDÆ.

37. *Eupetes Ajax*, Temm.

Pl. Col. 573; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

38. *Eupetes cærulescens*, Temm.

Pl. Col. 574; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

39. *Pitta Novæ Guineæ*, Müll. & Schl.

Verh. Zool. Aves. p. 19. *P. atricapilla*, Q. & G. Voy. Astrol. i. p. 258, pl. 8. fig. 3. Lobo (Müll.); Havre-Dorey (Less.). Mus. Par.

40. *Pitta Mackloti*, Müll. & Schl.

Verh. Zool. Aves. p. 18; Temm. Pl. Col. 547. Lobo (Müll.). Mus. Par. et Lugd.

41. *Pomatorhinus Isidori*, Less.

Voy. Coq. Zool. i. pl. 29. fig. 2. p. 680. *P. Geoffroyi*, G. R. Gray, Gen. B. i. p. 229; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Par. et Lugd.

42. *Brachypteryx murinus*.

Myiothera murina, Müll. MS. Lobo (Müll.). Mus. Lugd. *Turdiros-tris murina*, Bp. Consp. p. 218.

There are specimens of both sexes of this bird in the Leyden Museum, coloured alike. It seems congeneric with *B. capistratus* (*Myiothera capistrata*, Temm., Pl. Col. 185, fig. 1.), and I have therefore placed it in the genus to which that bird appears to belong. The following is a short description of the present species:—

Supra terricolori-brunneus, cauda rufescentiore, capite laterali cineras-

centiore: subtus ochraceo-rufescens, gutture albo, ventre medio albescente: rostri mandibula superiore nigra, inferiore albicante; pedibus pallidis: long. tota 4.5. poll. angl. et dec.

ORIOLIDÆ.

43. *Mimeta striata*, Q. & G.

Oriolus striatus, Q. & G., Voy. Astr. i. p. 195, pl. 9. fig. 2. *Oriolus melanotis*, Müll. M.S. *Mimeta melanotis*, Bp. Consp. p. 346. Havre-Dorey (Q. & G.). New Guinea and Timor. Mus. Lugd.

44. *Mimeta Mulleri*, Bp.

Consp. p. 346. *Oriolus viridissimus*, Temm. MS. Mus. Lugd.

45. *Xanthomelus aureus*, Linn., sp.

Oriolus aureus, Linn., Le Vaill. Paradis. pl. 18. *Sericulus aureus*, auct. et Bp. Consp. p. 349. Gen. *Xanthomelus*, Bp. Notes Orn. p. 75. Mus. Paris., Lugd. et Brit.

46. *Melanopyrrhus anais*, Less., sp.

Sericulus anais, Less. Rev. Zool. 1839, p. 44. Gen. *Melanopyrrhus*, Bp. Notes Orn. p. 9. *Pastor nigro-cinctus*, Cassin, Pr. Ac. Sc. Phil. 1850, p. 68. Mus. Paris. et Acad. Phil.

CAMPEPHAGIDÆ.

47. *Artamus papuensis*, Bp.

Consp. p. 344. *Ocypterus leucorhynchus*, Müll. Verh. Ethn. p. 21. R. Oetanata (Müll.). Mus. Lugd.

48. *Graucalus Desgrazii*, Puch.

H. & J. Voy. au P. S. pl. 7, fig. 1; Zool. iii. p. 64. Mus. Paris.

49. *Graucalus melanops*, Lath., sp.?

Müll. Verh. Ethn. p. 190; Gould, B. Austr. ii. pl. 55. West coast of N. G. (Müll.). Mus. Lugd.

There are specimens of a *Graucalus* in the Leyden Museum from New Guinea and Amboyna which are there considered to be the same as this Australian species, but I doubt the correctness of this reference.

50. *Graucalus larvatus*, Müll. & Schl.

Cebblepyris larvata, Verh. Ethn. p. 190. Mus. Lugd.

The specimens of this bird in the Leyden Museum are some of them marked "New Guinea," but Müller and Schlegel give Java as the correct habitat.

53. *Graucalus papuensis*, Gm., sp.

Corvus papuensis, Gm. S. N. i. p. 371; Müll. Verh. Ethn. p. 191. Lobo (Müll.). Mus. Lugd. et Par.

Also in the Leyden Museum from the Banda Is., Ternate and Celebes

54. *Ptiladela Boyeri*, Puch.

Voy. au P. S. pl. 9. fig. 3; Zool. iii. p. 68. West coast of N. G. Mus. Paris.

55. *Campephaga schisticeps*, Puch.

Ceblepyris schisticeps, Puch. Voy. au P. S.; Zool. iii. p. 70, pl. 10. fig. 1. West coast of N. G. Mus. Par.

56. *Campephaga plumbea*, Müll. & Schl.

Ceblepyris plumbea, Müll. & Schl. Verh. Ethn. p. 189. R. Oetanata (Müll.). Mus. Lugd.

57. *Edoliisoma melan*, Müll. & Schl., sp.

Ceblepyris melas, Müll. & Schl. Verh. Ethn. p. 189 (♂), et *C. cinna-momea*, ibid. (♀): *E. marescoti*, Puch. Voy. au P. S., Zool. iii. p. 70, pl. 10. fig. 2. West coast of N. G. (H. & J.); Lobo (*Puch.*). Mus. Par. et Lugd.

58. *Dicrurus megarhynchus*, Q. & G., sp.

Edolius megarhynchus, Q. & G., Voy. Astrol. Zool. i. p. 184, pl. 6. Havre-Dorey (Q. & G.). Mus. Paris.

59. *Dicrurus carbonarius*, Müll. MS.

Bp. Consp. p. 352. Lobo (Müll.). Mus. Lugd.

EURYLEMIDÆ.

60. *Peltops Blainvillii*, Garn., sp.

Eurylaimus Blainvillei, Garn. Voy. Coq. i. p. 595, pl. 19; Bp. Consp. p. 169. Havre-Dorey (Garn.). Mus. Paris.

MUSCICAPIDÆ.

61. *Arses chrysomela*, Less., sp.

Muscicapa chrysomela, Less. Voy. Coq. i. pl. 18. fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

62. *Arses telescophtalma*, Garn., sp.

Muscicapa telescophtalma, Garn. Voy. Coq. i. p. 593, pl. 18. fig. 1; Müll. Verh. Ethn. p. 22. Havre-Dorey (Garn.). Lobo (Müll.). Mus. Par. et Lugd.

63. *Monarcha guttula*, Garn., sp.

Musc. guttula, Garn. Voy. Coq. Ois. pl. 16. fig. 2. p. 591; Bp. Consp. i. p. 326. Havre-Dorey. Mus. Par.

64. *Monarcha inornata*, Garn., sp.

Musc. inornata, Garn. Voy. Coq. Ois. pl. 16. fig. 1. p. 591. Havre-Dorey (Garn.).

65. *Todopsis cyanocephala*, Q. & G., sp.

Todus cyanocephalus, Q. & G., Voy. Astrol. i. p. 227, pl. 5, fig. 4; Voy. au P. S. pl. 20. fig. 2; Zool. iii. p. 79. Gen. *Todopsis*, Bp. Notes Orn. p. 80. Havre-Dorey (Q. & G.). Mus. Paris.

66. *Tchitrea Enado*, Less., sp.

M. Enado, Less., Voy. Coq. i. p. 643, pl. 15. fig. 2. Havre-Dorey (*Less.*).

67. *Tchitrea Gaimardi*, Less., sp.

M. Gaimardi, Less., Trait. d'Orn. i. p. 386.

68. *Rhipidura threnothorax*, Müll. & Schl.

Verh. Ethn. p. 185. Lobo (*Müll.*).

69. *Rhipidura rufiventris*, Müll. & Schl.

Verh. Ethn. p. 185. Lobo (*Müll.*).

70. *Rhipidura gularis*, Müll. & Schl.

Verh. Ethn. p. 185. Lobo, R. Oetanata and P. Marianne's Straits (*Müll.*).

LANIIDÆ.

71. *Ptererythrius spinicaudus*, Puch.

Voy. au P. S. Zool. iii. p. 58, pl. 6. fig. 2. Gen. *Pucherania*, Bp. Notes Orn. p. 73. Warrior's Is., Torres Straits (*H. & J.*). Mus. Paris.

72. *Pachycephala lugubris*, Müll. MS.

R. Oetanata (*Müll.*). Mus. Lugd.

73. *Pachycephala virescens*, Temm. MS.

Lobo (*Müll.*). Mus. Lugd.

74. *Myiolestes megarhynchus*, Q. & G., sp.

Muscicapa megarhyncha, Q. & G., Voy. Astrol. i. pl. 3. fig. 1, p. 172; Bp. Consp. i. p. 358. *Napothera elaeioides*, Müll. M.S. Havre-Dorey (*Q. & G.*). Mus. Lugd.

75. *Myiolestes pulverulentus*, Müll. MS.

Bp. Consp. p. 358. Mus. Lugd.

76. *Rectes cirrhocephalus*, Less., sp.

Vanga kirrhocephalus, Less. Voy. Coq. i. p. 633, pl. 11. *Timalia poliocephala*, Müll. MS. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Par. et Lugd.

77. *Rectes dichrous*, Bp., sp.

Compt. Rend. xxxi. p. 563. *Garrulax bicolor*, Müll. MS. Lobo (*Müll.*). Mus. Lugd.

♂ et ♀ similis. Saturate rufo-cinnamomeus, abdomine dilutiore; capite cristato toto cum gutture, cervice, alis et cauda nigerrimis; rostro et pedibus nigris: long. tota 8·5, alæ 3·75, caudæ 3·6, poll. angl. et dec.

78. *Rectes strepitans*, Puch., sp.

H. & J. Voy. au P. S. Ois. pl. 6. fig. 1; Zool. iii. p. 60. *Rectes ferru-*

gineus, Bp. Compt. Rend. xxxi. p. 563. West Coast of N. G. (*H. & J.*); Lobo (*Müll.*). Mus. Paris. et Lugd.

79. *Cracticus cassicus*, Bodd., sp.

Pl. Enl. 628; unde *Ramphastos cassicus*, Bodd., et *Coracias varia*, Gm., *Barita Sonnerati*, Less. Trait. d'Orn. i. p. 346. *Barita varia*, Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Paris.

80. *Cracticus personatus*, Temm. MS.

Albus, plaga dorsi medii et capite toto cum gutture et pectore nigerrimis; alis caudaque nigris, secundariorum pogoniis externis et rectricum apicibus albis; rostri cærulescenti-plumbei basi alba, pedibus nigris. Long. tota 11·5, alæ 6·7, caudæ 4·6 poll. angl. et dec.

Lobo (*Müll.*). Mus. Lugd. Nearly allied to *C. picatus* (Gould B. Austr. ii. pl. 50). Perhaps not different from the former species.

81. *Cracticus Quoyi*, Less., sp.

Barita Quoyi, Less. Voy. Coq. i. p. 639; Gould, B. Austr. ii. pl. 53. Havre-Dorey (*Less.*). Mus. Par. et Brit.

CORVIDÆ.

82. *Gymnocorvus senex*, Less., sp.

Corvus senex, Less. Voy. Coq. i. p. 651, pl. 24. *Gymnocorvus tristis*, Less. Tr. d'Orn. i. p. 327. Havre-Dorey (*Less.*). Mus. Paris.

83. *Corvus Orru*, Bp.

Consp. i. p. 385. Havre-Dorey (*Less.*). Mus. Paris.

PARADISEIDÆ.

84. *Manucodia chalybea*, Bodd.

Pl. Enl. 634; unde *Manucodia chalybea*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 100, unde *Paradisea viridis*, Scop. *Phonygama viridis*, G. R. Gray, et Bp. Consp. i. p. 368; Müll. Verh. Ethn. p. 22. Havre-Dorey (*Less.*); Lobo (*Müll.*).

85. *Manucodia Keraudreni*, Less., sp.

Barita Keraudreni, Less. Voy. Coq. i. p. 636, pl. 13. *Chalybæus cornutus*, Cuv. *Phonygama Lessonia*, Sw. Havre-Dorey (*Less.*). Mus. Paris. et Lugd.

86. *Manucodia atra*, Less.

Phonygama atra, Less. Voy. Coq. i. p. 639. Havre-Dorey (*Less.*).

87. *Paradisea apoda*, Linn.

Less. Voy. Coq. i. p. 526. Aroo Isl. (*Lesson*). Mus. Par., Lugd. et Brit.

Mr. Wallace also has lately found this bird abundant at the Aru Isl. I am not aware of its having been observed alive upon the mainland of New Guinea.

88. *Paradisea papuana*, Bechst.

Less. Voy. Coq. i. p. 446; Müll. Verh. Ethn. p. 70; Bp. Consp. i. p. 413. Havre-Dorey (*Less.*); Lobo and r. Octanata (*Müll.*). Mus. Par. et Lugd.

89. *Paradisea rubra*, Daud.

Bp. Consp. i. p. 443; Less. Voy. Coq. i. p. 662. Waigiou (*Less.*). Mus. Par. et Lugd.

90. *Diphyllodes speciosa*, Bodd., sp.

Pl. Enl. 631, unde *P. speciosa*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 98, unde *P. magnifica*, Scop. Less. Voy. Coq. i. p. 446. Mus. Paris. et Lugd.

Skins of this bird were obtained by Lesson and Garnot from the natives at Havre-Dorey, but we have no record of its being found alive.

91. *Diphyllodes Wilsoni*, Cassin.

Lophorina respublica, Bp. Compt. Rend. 1850, p. 131, et Compt. Rend. 1850, p. 291. *D. respublica*, Bp. Consp. p. 413. *Paradisea Wilsoni*, Cassin, Pr. Ac. Sc. Phil. 1850, p. 57; Trans. Ac. Phil. Mus. Acad. Philadelph., specimen unicum!

In the 'Proceedings of the Zoological Society' for this year (p. 6), I have stated my reasons for preferring Mr. Cassin's name to Prince Bonaparte's for this bird.

92. *Cicinnurus regius*, Linn.

P. regia, Linn., Bp. Consp. i. p. 413; Müll. Verh. Ethn. p. 22; Less. Voy. Coq. i. p. 658. Havre-Dorey (*Less.*); Lobo and r. Octanata (*Müll.*); Aru Isl. (*Wallace*). Mus. Par. et Lugd.

93. *Lophorina atra*, Bodd.

Pl. Enl. 632, unde *P. atra*, Bodd.: Sonn. Voy. Nouv. pl. 96, unde *P. superba*, Scop., Bp. Consp. p. 414. Mus. Paris. et Lugd.

Lesson obtained skins of this species from the natives at Havre-Dorey.

94. *Parotia sexpennis*, Bodd., sp.

Pl. Enl. 633; unde *P. sexpennis*, Bodd.; *Parotia aurea*, Bp. Consp. p. 414. Mus. Paris. et Lugd.

EPIMACHIDÆ.

95. *Seleucides albus*, Blum., sp.

Bp. Consp. p. 412. Mus. Paris. et Lugd.

96. *Epimachus maximus*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 101; unde *Merops maximus*, Scop., Bp. Consp. p. 412; *Epimachus filamentosus*, Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Lugd. et Paris.

97. *Ptilorhis magnifica*, Vieill., sp.

Craspedophora magnifica, Bp. Consp. p. 412; Gould, Suppl. B. Austr. Mus. Paris., Lugd. et Acad. Philadelph.

When examining the specimens of this bird contained in the magnificent collection of the Academy of Natural Sciences of Philadelphia, I noticed considerable differences between the Australian and New Guinea examples. In the former, the pectoral patch seemed to be broader and terminated below in a semi-circular form, in the latter to be much narrower and nearly straight in its lower margin.

STURNIDÆ.

98. *Paradigalla carunculata*, Less.

Rev. Zool. 1840, p. 1; Voy. Bonite, Ois. pl. 1; Bp. Consp. p. 414; Mus. Paris. et Acad. Philadelph.

99. *Astrapia nigra*, Gm., sp.

Bp. Consp. p. 414. Mus. Paris. et Lugd.

100. *Calornis metallica*, Temm.

Pl. Col. 266. *Calornis Cantor*, Müll. Verh. Ethn. p. 21. Lobo (Müll.). Mus. Lugd.

101. *Gracula Dumonti*, Less., sp.

Mino Dumontii, Less. Voy. Coq. i. p. 653, pl. 25; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Lugd. et Paris.

PSITTACIDÆ.

102. *Aprosmictus amboinensis*, Linn.

Psitt. amboinensis, Linn. S. N. i. p. 141; Pl. Enl. 240. *P. dorsalis*, Q. & G. Voy. Astrol. i. p. 234, pl. 21, fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

103. *Cyanorhamphus Novæ Guinææ*, Bp.

Consp. Psitt. in Cabanis' Journ. f. Orn.

Prince Bonaparte has included this name in his "Table of Parrots," but I am not aware that he has published any description of the bird.

104. *Trichoglossus cyanogrammus*, Wagl.

Wagl. Mon. Psitt. p. 554; Müll. Verh. Ethn. p. 108. West coast of N. G. (Müll.). Mus. Lugd.

105. *Trichoglossus placens*, Temm., sp.

Psitt. placentis, Temm. Pl. Col. 553; Müll. Verh. Ethn. p. 23. *R. Oetana* (Müll.). Mus. Lugd.

106. *Charmosyna papuana*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 111. *Psitt. Papua*, Scop. *Psitt. Papuensis*, Gm. Less. Voy. Coq. i. p. 630; Müll. Verh. Ethn. 107. Havre-Dorey (*Less.*). Mus. Paris. et Lugd.

107. *Lorius domicella*, Linn.

Less. Voy. Coq. i. p. 627. Havre-Dorey (*Less.*). Mus. Paris. et Lugd.

108. *Lorius tricolor*, Stephens.

Pl. Enl. 168. *Psitt. Lory*, Less. Voy. Coq. i. p. 628. Havre-Dorey (*Less.*). Mus. Paris.

109. *Eos squamata*, Bodd., sp.

Pl. Enl. 684; unde *Psitt. squamatus*, Bodd. *Psitt. Guebiensis*, Less. Voy. Coq. i. p. 628. Havre-Dorey et Guebé (*Less.*). Mus. Paris. et Lugd.

110. *Chalcopsitta atra*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 110; unde *Psitt. ater*, Scop.; *Psitt. Novæ Guineæ*, Gm., Bp. P. Z. S. Mus. Lugd.

111. *Chalcopsitta scintillans*, Temm., sp.

Pl. Col. 569; Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Lugd. et Paris.

The specimens of this bird in the Paris Museum were obtained at the Aru Isl. by MM. Hombron and Jacquinot.

112. *Eclectus cardinalis*, Bodd., sp.

Pl. Enl. 518; unde *Psitt. cardinalis*, Bodd., et *Psitt. puniceus*, Gm. *Eclectus puniceus*, Bodd. Pr. Z. S. 1849, p. 143; Less. Voy. Coq. i. p. 627. *Eclectus grandis*, Müll. Verh. Ethn. p. 22. Havre-Dorey (*Less.*); Lobo (*Müll.*).

113. *Polychlorus grandis*, Gm., sp.

Sonn. Voy. Nouv. Guin. pl. 108; unde *Psitt. polychloros*, Scop., et *Psitt. grandis*, Gm. *Psitt. Sinensis*, Less. Voy. Coq. i. p. 627. *Eclectus polychloros*, Müll. Verh. Ethn. p. 22. Gen. *Polychlorus*, Sclater in P. Z. S. 1857, p. 226. Lobo (*Müll.*); Havre-Dorey (*Less.*). Mus. Paris. et Lugd.

114. *Psittacodis Stavorini*, Less., sp.

Wagler, Mon. Psitt. p. 574, pl. 33. *Psitt. Stavorini*, Less. Voy. Coq. i. p. 628. I. Waigiou (*Less.*).

115. *Geoffroius personatus*, Shaw, sp.

Psitt. batuvensis, Gm.; Müll. Verh. Ethn. p. 22, et *Psitt. Geoffroyi*, ibid. p. 107. Lobo (*Müll.*).

116. *Geoffroius Pucherani*, Bp.

Pionus fuscicapillus, Puch. Voy. au P. S. Zool. pl. 3, p. 111, pl. 25 bis, fig. 3. West coast of N. G. (*H. & J.*). Mus. Paris.

117. *Cyclopsitta Desmaresti*, Garn., sp.

Voy. Coq. i. p. 600, pl. 35; Müll. Verh. p. 22. Havre-Dorey (*Garn.*); Lobo (*Müll.*). Mus. Par. et Lugd.

118. *Cyclopsitta diophthalma*, H. & J., sp.

Ann. d. Sc. Nat. sér. ii., xvi. p. 313; Voy. au P. S. pl. 25*. fig. 4 et 5; et Zool. iii. p. 107. S. coast of N. G. Mus. Par.

119. *Nasiterna pygmæa*, Q. & G., sp.

Psitt. pygmæus, Q. & G. Voy. Astrol. i. p. 232, pl. 21. *Micrositta pygmæa*, Less. Tr. d'Orn. p. 646; Müll. Verh. Ethn. pp. 23 et 107. Havre-Dorey (Q. & G.); r. Oetanata (*Müll.*).

120. *Cacatua Triton*, Temm.

Coup d'œil, s. l. Poss. Néd. iii. p. 405. *P. galeritus*, Less. Voy. Coq. i. p. 624, et Müll. Verh. p. 21. Havre-Dorey (*Less.*); west coast of N. G. (*Müll.*). Mus. Lugd.

This species is very nearly allied to the *C. galerita* of Australia. Mr. Gould (B. Austr. vol. v. p. 1) seems to consider it as hardly different.

121. *Cacatua æquatorialis*, Temm.

Coup d'œil s. l. Poss. Néd. iii. p. 405. *C. sulphurea*, Less. Voy. Coq. i. p. 625. Havre-Dorey (*Less.*). Mus. Lugd.

122. *Microglossa aterrima*, Gm., sp.

Less. Voy. Coq. i. p. 625. *Psitt. Goliath*, Müll. Verh. Ethn. p. 22; Gould, B. Austr. suppl. pt. i. pl. 5. Havre-Dorey et Waigiu (*Less.*); Lobo (*Müll.*). Mus. Paris. et Lugd.

123. *Microglossa Alecto*, Temm.

Bp. Consp. i. p. 7. Mus. Lugd.

CUCULIDÆ.

124. *Centropus Menebeki*, Garn.

Voy. Coq. i. p. 600, pl. 3; Müll. Verh. Ethn. p. 22. Havre-Dorey (*Less.*); Lobo (*Müll.*).

125. *Eudynamys rufiventris*, Less., sp.

Cuculus rufiventer, Less. Voy. Coq. i. pl. 623. Havre-Dorey (*Less.*). Mus. Paris.

126. *Hierococcyx leucolophus*, Müll. & Schl.

Verh. Ethn. pp. 22 et 233. Lobo (*Müll.*). Mus. Lugd.

127. *Chrysococcyx lucidus*, Gm.

Müll. Verh. p. 21; Bp. Consp. p. 106; Gould, B. Austr. iv. pl. 39. Lobo (*Müll.*).

COLUMBIDÆ.

128. *Goura coronata*, Linn.

Bp. Consp. ii. p. 96; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd. et Brit.

129. *Goura Victoriae*, Fraser.

Bp. Consp. ii. p. 96. *G. Steursii*, Temm. Mus. Lugd. et Brit.

130. *Calenas nicobarica*, Linn., sp.

Bp. Consp. ii. p. 95; Less. Voy. Coq. ii. p. 145.

131. *Ptilonopus viridis*, Linn., sp.

Bp. Consp. ii. p. 24; Knip, Pig. pl. 17; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

132. *Ptilonopus Lechlancheri*, Bp., sp.

Trerolæma Lechlancheri, Bp. Compt. Rend. xli. p. 247. Mus. Paris. et Brit.

133. *Ptilonopus cyanovirens*, Less., sp.

Bp. Consp. ii. p. 23; Less. Voy. Coq. i. p. 713. pl. 42. Havre-Dorey (Less.). Mus. Paris.

134. *Ptilonopus perlatus*, Temm., sp.

Pl. Col. 559; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

135. *Ptilonopus naina*, Temm., sp.

Pl. Col. 565; Bp. Consp. ii. p. 25; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

136. *Ptilonopus pulchellus*, Temm., sp.

Pl. Col. 564; Bp. Consp. ii. p. 22; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

137. *Ptilonopus superbus*, Temm., sp.

Bp. Consp. ii. p. 18; Gould, B. Austr. v. pl. 57; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

138. *Carpophaga myristicivora*, Scop., sp.

Bp. Consp. ii. p. 31; Sonn. Voy. Nouv. Guin. pl. 102; unde *C. myristicivora*, Scop. New Guinea (Scop.).

139. *Carpophaga bicolor*, Scop., sp.

Sonn. Voy. N. Guin. pl. 103. unde *C. bicolor*, Scop.; Bp. Consp. ii. p. 36. New Guinea (Sonn.). Mus. Brit.

142. *Carpophaga luctuosa*, Temm., sp.

Pl. Col. 247; Gould, B. Austr. v. pl. 60; Bp. Consp. ii. p. 36. New Guinea (Belcher). Mus. Brit.

143. *Carpophaga Mülleri*, Temm., sp.

Pl. Col. 566; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

144. *Carpophaga Pinon*, Q. & G., sp.

Col. Pinon, Q. & G., Voy. Uranie, pl. 28. p. 118; Bp. Consp. ii. p. 37.
I. Rawak (Q. & G.). Mus. Paris.

145. *Carpophaga Zoa*, Less., sp.

Col. Zoa, Less. Voy. Coq. pl. 39. p. 705; Bp. Consp. ii. p. 38. Havre-Dorey (Less.). Mus. Paris.

146. *Carpophaga rufigastra*, Q. & G., sp.

Voy. Astrol. pl. 27, p. 245; Bp. Consp. ii. p. 38. Havre-Dorey (Q. & G.).
Mus. Paris.

147. *Carpophaga puella*, Less., sp.

Col. puella, Less. Man. d'Orn. p. 172; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. R. Oetanata (Müll.). Mus. Lugd. et Brit.

148. *Macropygia Doreya*, Bp.

Consp. ii. p. 57. Mus. Paris.

149. *Geopelia humeralis*, Temm., sp.

Pl. Col. 191; Gould, B. Austr. v. pl. 72; Bp. Consp. ii. p. 93. Lobo (Müll.). Mus. Lugd. et Brit.

150. *Chalcophaps Stephani*, Puch.

Voy. au P. S. pl. 28. fig. 2; Zool. iii. p. 119; Bp. Consp. ii. p. 93.
West coast of N. G. (H. & J.); Lobo (Müll.). Mus. Paris. et Lugd.

151. *Eutrygon terrestris*, Puch., sp.

Trugon terrestris, Puch. Voy. au P. S. Zool. iii. p. 123. pl. 28, fig. 1;
Bp. Consp. ii. p. 86. West coast of N. G. (H. & J.). Mus. Paris.

I have slightly modified the generic name of this peculiar type, *Trugon*, correctly written *Trygon* (τρυγών), having been previously used for another division by Prof. Reichenbach.

STRUTHIONIDÆ.

152. *Casuaris Emeu*, Lath., sp.

Less. Voy. Coq. i. p. 717; Müll. Verh. Ethn. p. 109. Havre-Dorey (Less.); S.W. coast (Müll.).

MEGAPODIDÆ.

153. *Tatagalla Cuvieri*, Less.

Voy. Coq. i. p. 715, pl. 38. Havre-Dorey (Less.).

154. *Megapodius rubripes*, Temm.

Pl. Col. 411; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

155. *Megapodius Freycineti*, Q. & G.

Voy. Uranie, Ois. pl. 32. p. 125. Isl. Waigiou and Guebé (H. & J.).

156. *Megapodius Duperreii*, Less.

Voy. Coq. i. p. 700. pl. 36. Havre-Dorey (Less.).

There appears to be much confusion among the true *Megapodii*. In the Leyden Museum there are specimens of four distinct species:—1. *M. Freycineti*, ex Ternate (Forster); 2. *rubripes*, ex Nov. Guinea et Celebes; 3. *tumulus*, ex Australia; and 4. an undescribed species from Ceram.

CHARADRIIDÆ.

157. *Esacus magnirostris*, G. S. Hilaire, sp.

Temm. Pl. Col. 387; Gould, B. Austr. vi. pl. 6. R. Oetanata (Müll.). Mus. Lugd.

158. *Hiaticula inornata*, Gould.

B. Austr. vi. pl. 19. Oomaga Is., Torres Straits (Lieut. Ince); coast of N. G. (Gould).

159. *Glareola Isabella*, Vieill.

G. grallaria, Temm.; Gould, B. Austr. vi. pl. 22; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

160. *Hæmatopus longirostris*, Vieill.

Gould, B. Austr. vi. pl. 7. *H. ostralegus*, Müll. Verh. Ethn. p. 21? Coasts of N. G. (Müll.).

161. *Streptilas interpres*, Linn., sp.

Raines Islets, Torres Straits (Gould).

ARDEIDÆ.

162. *Herodias Novæ Guineæ*, Gm., sp.

Bp. Consp. ii. p. 121. Mus. Paris.

163. *Botaurus heliosylus*, Less.

Voy. Coq. Zool. i. p. 722. pl. 44; Bp. Consp. ii. 136. Havre-Dorey (Less.). Mus. Paris.

SCOLOPACIDÆ.

164. *Himantopus leucocephalus*, Gould.

B. Austr. vi. pl. 7; Müll. Verh. Ethn. p. 21. Coasts of N. G. (Müll.).

165. *Numenius uropygialis*, Gould.

B. Austr. vi. pl. 43. *N. phæopus*, Müll. Verh. Ethn. p. 22? Coasts of N. G. (Müll.).

166. *Schœniclus albescens*, Gould.

B. Austr. vi. pl. 31. *Tringa pusilla*, Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.).

167. *Tringoides empusa*, Gould, sp.

Actitis empusa, Gould, B. Austr. vi. pl. 35. *T. hypoleucus*, Müll. Verh. Ethn. p. 22. Coasts of N. G. (Müll.).

RALLIDÆ.

168. *Parra gallinacea*, Temm.

Pl. Col. 427; Gould, B. Austr. vi. pl. 25.

LARIDÆ.

169. *Sterna melanauchen*, Temm.

Pl. Col. 427; Gould, B. Austr. vii. pl. 28; Müll. Verh. Ethn. p. 125. Coast of N. G. (Müll.).

170. *Sterna velox*, Rüpp.?

Müll. Verh. Ethn. p. 125. West coast of N. G. (Müll.).

ERRATA.

Page 58, line 3, for FORMICA IRRITANS read FORMICA HOSTILIS.

— 101, erase under PELOPÆUS JAVANUS, the habitat Borneo. The species from Borneo is described in the paper on the Hymenoptera of Celebes, and named *Pelopæus benignus*.

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JOURNAL
OF
THE PROCEEDINGS
OF
THE LINNEAN SOCIETY.

ZOOLOGY.

VOL. III. 1859

LONDON:
LONGMAN, BROWN, GREEN, LONGMANS & ROBERTS,
AND
WILLIAMS AND NORGATE.

1859.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

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JOURNAL OF THE PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

On the Importance of an Examination of the Structure of the Integument of Crustacea in the determination of doubtful Species.—Application to the genus *Galathea*, with the Description of a New Species of that Genus. By SPENCE BATE, Esq., F.L.S.

[Read January 21, 1858.]

OF the various genera of Decapod Crustacea none are more interesting, or more difficult of description, than those which constitute the family Galatheadæ.

The interest attaching to these forms arises from the intermediate position which they occupy in the natural arrangement of the class, their structure placing them between the Macrura and Brachyura; in accordance with which we find that, whilst Professor M.-Edwards classes them among the Macrura, Professor Bell, in his work on the British Crustacea, places them (more correctly, as we think) in the intermediate group of Anomura.

This opinion is fully borne out both in the development of the animals and in their structure in the adult state.

The early form of the larva bears, anteriorly, a resemblance to the Brachyural type, whilst the caudal appendages assimilate to those of the Macrura. The same conditions obtain in the young of Anomura. At the time of birth, the larva, like that of the Brachyura, has only the two gnathopoda developed, whilst the

termination of the tail is like that of a fish, as in the *Macrura*. In the adult, the internal antennæ possess short flagella and complementary appendages, such as exist in the order *Brachyura*, whilst the external antennæ have the long and slender flagella proper to the *Macrura*. The *scale*, however, commonly appended to the external antennæ in the latter order is wanting, a circumstance which exhibits a relation to the *Brachyura*.

An examination of the legs shows that the coxæ are fused with the thorax, as in the *Brachyura*, and not articulated with it as in the *Macrura*, whilst, on the other hand, the posterior division and caudal termination approach the *Macrural* type more nearly than that of the *Brachyura*, the animal thus assuming a character intermediate between the two orders.

But in the description of the several species of the genus *Galathea*, a peculiar difficulty appears to arise, originating in the affinity which they bear to each other. So close, in fact, is the approximation, that the descriptions of the best writers will scarcely avail for the distinction of the individual species without the assistance of figures. This arises from the fact that the general characters, upon which the descriptions are based, vary, in this genus, only in their comparative degrees of development.

In the three species recognized in Professor Bell's work on the British Crustacea, it will be found that each species retains the same characters in greater or less degree.

Galathea strigosa is peculiar for the spinous character of the carapace and cheliform legs. Every spine, however, is repeated in both the other species, only less developed. We find the rostrum furnished with four lateral teeth on each side, a character which also exists in each of the other species; and although close observation may detect a slightly different arrangement in the relative position of these teeth, the differences are not of sufficient importance to enable a naturalist thence to derive a specific distinction, unless the peculiarity is seconded by some more unqualified character less liable to be affected by any peculiarity of condition.

In order to arrive at more certain results in the identification of species, we think that the microscopic examination of the surface of the integument will be found peculiarly useful.

This mode of examination of species may also be applied to a considerable extent throughout the Crustacea generally with great advantage; and if found valuable in recent, there can be no doubt that it will prove of far greater importance in extinct forms, where

parts on which the identification of species usually rests are lost, and fragments only of the animal obtainable.

It should be borne in mind that, as the structure in question undergoes modifications more or less considerable in different parts of the animal, it will always be advisable to compare the corresponding parts with each other.

Applying this test to the known species of *Galathea*, we perceive that the structure of the integument upon the arms, independent of the marginal spines, exhibits a squamiform appearance, but that the scales, which characterize the structure, possess features peculiar to each species.

In *Galathea strigosa* the scales are convex, distant from each other, smooth at the edge, and fringed with long hairs. In *G. squamifera* they are convex, closely placed, scalloped at the edge, and without hairs. In *G. nexa* the scales are obsolete, tufts of hair representing the supposed edges. In *G. depressa*, n. sp., the scales are broad, less convex than in *G. strigosa* and *G. squamifera*, smooth, closely set, and fringed with short hairs. In *G. Andrewsii* they are small, distant, very convex, tipped with red, and slightly furnished with hair.

As another instance of the practical application of the microscopical examination of the surface, I would refer to two species of Amphipoda, classed by Leach under the name of *Gammarus Locusta*, from his inability to assign them any separate specific characters. In the structure of their integuments, however, these two forms will be found to exhibit widely different microscopical appearances.

Again, there exists in the same group three or four species, the description of any one of which would apply to either of the others; and it is probable they would never have been ranked as separate species had not their habitats been geographically distant. Thus *Gammarus Olivii*, M.-Ed., *G. affinis*, M.-E., *G. Kröyeri*, Rathke, and *G. gracilis*, R., can only be specifically determined by a microscopic examination of the integument.

The same may be said of other Amphipoda, such as *Urothoe inostratus*, Dana, from South America, which so nearly resembles in form the *U. elegans* of the British shores.

GALATHEA DISPERSA, mihi.

G. rostro brevi, dentibus 4 utrinque ornato, 2 anterioribus minoribus; pedibus anterioribus elongatis, sparse spinosis; chelarum digitis parallelis.

Galathea with short rostrum, armed on each side with 4 teeth, the two posterior being less important than the two anterior. The fingers of the chelæ impinge through their whole length; outer margin of the hand furnished with 3 or 4 small spines.

Hab. Trawling-ground, Plymouth, common; Moray Frith, Scotland.

This species unites *G. Andrewsii* with *G. nexa*, and, I think, has often been mistaken for the young of the latter; but *G. nexa*, so far as my experience goes, is a species peculiar to the north of England, whereas *G. dispersa*, I anticipate, will be found to be the most universally dispersed, in deep water, of any of the species known. It can always be detected from *G. nexa* by the form of the hand and the manner in which the fingers impinge: in *G. nexa* the hand is broad towards the extremity, and the fingers meet only at the apex; in *G. dispersa* the hand gradually narrows to the apex, and the fingers meet each other through their whole length, the inner margin of the finger being finely serrated, the thumb not.

It also may be distinguished from *G. Andrewsii* by the breadth of the hands, which are narrow and round in *G. Andrewsii*, and moderately broad and flat in *G. dispersa*.

By an examination of the texture of the integument under a magnifying power of low degree, the surface of *G. dispersa* will be seen distinctly to differ from that of any of the others; it is covered with flat scales, fringed with short cilia. The length of the animal, including the arms, is about $2\frac{1}{4}$ inches.

Catalogue of Hymenopterous Insects collected at Celebes by Mr. A. R. WALLACE. By FREDERICK SMITH, Esq., Assistant in the Zoological Department, British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., F.L.S.

[Read April 15th, 1858.]

THIS collection of the Hymenoptera of Celebes is specially interesting, as adding greatly to our knowledge of the geographical range of many well-known species, while the additions made to the Fossorial group contain many of great beauty and rarity. A new species belonging to the tribe of Solitary Wasps, *Odynerus clavicornis*, is perhaps the most interesting insect in the collection; this Wasp has clavate antennæ, the flagellum being broadly dilated towards the apex, convex above and concave beneath. I am not acquainted with any other insect belonging to the Vespid group which exhibits such an anomaly.

Fam. ANDRENIDÆ, *Leach.*Gen. SPHECODES, *Latr.*

1. SPHECODES INSULARIS. *S. niger*, abdominis segmentis primo secundo et tertio (basi) rubris; alis hyalinis.

Male. Length $3\frac{1}{2}$ lines. Head and thorax black, closely and strongly punctured; the face below the antennæ with silvery-white pubescence; the joints of the flagellum submoniliform; the mandibles ferruginous. Thorax: the tegulæ pale rufo-testaceous, wings hyaline, the nervures ferruginous; the metathorax coarsely rugose; the articulations of the legs and the tarsi ferruginous. Abdomen: the first, second, and base of the third segments red, the apical ones black, very finely and closely punctured, with the apical margins of the segments smooth and shining; a black spot in the middle of the basal segment.

Hab. Celebes.

Gen. NOMIA, *Latr.*

1. NOMIA PUNCTATA. *N. nigra nitida punctata*, alis nigro-fuscis.

Male. Length $4\frac{1}{2}$ lines. Shining black: head and thorax coarsely punctured, the metathorax ruggedly sculptured, truncate at the apex, the truncation and sides smooth with a few fine punctures; the abdomen closely and rather finely punctured, the apical margins of the segments smooth and shining. The tips of the mandibles, the tarsi and apex of the abdomen rufo-testaceous, the wings fuscous.

Hab. Celebes.

2. NOMIA FLAVIPES. *N. nigra pedibus flavis*, abdomine cinereo fasciato, alis hyalinis.

Female. Length $3\frac{1}{4}$ lines. Black; the face and cheeks densely clothed with short cinereous pubescence, the vertex thinly so; the margins of the prothorax, mesothorax and scutellum with a line of pale ochraceous pubescence, the disk of the thorax thinly covered with short pubescence of the same colour, the emargination of the metathorax as well as its sides with longer pubescence of the same colour; the base of the abdomen and basal margin of the second and following segments covered with short cinereous pubescence. The flagellum beneath fulvous; the mandibles ferruginous. The legs reddish-yellow, with the coxæ and base of the femora black; the wings hyaline; the tegulæ yellow, the nervures pale testaceous.

Hab. Celebes.

3. NOMIA FORMOSA. *N. capite thoraceque nigris*; abdomine chalybeo; marginibus apicalibus segmentorum cæruleo fasciatis.

Female. Length $5\frac{1}{2}$ lines. Head and thorax black and very closely punctured; the face covered with griseous pubescence; the clypeus with a central longitudinal carina. Thorax: the apical margin of the prothorax, the margins of the scutellum, and the sides of the meta-

thorax covered with a dense short ochraceous pubescence; the disk of the thorax thinly sprinkled with short black hairs; the posterior tibiæ obscurely ferruginous; the tarsi ferruginous; the legs covered with bright golden-yellow pubescence; wings subhyaline, the nervures ferruginous; the tegulæ yellow with a fuscous stain in the middle. Abdomen obscurely chalybeous, closely punctured, the two basal segments strongly so; the apical margins of the segments with smooth shining narrow blue fasciæ.

Male. Closely resembling the female, but with the legs black; the posterior femora incrassate, the tibiæ narrow at their base and broadly dilated at their apex, which, as well as the calcaria, are pale testaceous.

This species closely resembles a species from North China, *N. chalybeata*, Westw. MS., from which it is readily distinguished by the form of the fourth ventral segment, which is notched in the middle, rounded, and then emarginate with the lateral angles rounded; in the species from China the margin is arched, and fringed with fulvous pubescence.

4. *NOMIA HALIOTOIDES*. *N. nigra*, pube cinerea tecta, abdominis segmentis intermediis pube alba fasciatis.

Female. Length $4\frac{1}{2}$ lines. Black; head and thorax opaque, and thinly clothed with cinereous pubescence, that on the disk of the thorax and margin of the scutellum slightly ochraceous. The flagellum fulvous beneath, the mandibles ferruginous at their apex; the tarsi ferruginous, wings hyaline, nervures fuscous, stigma testaceous. Abdomen shining, delicately punctured; the basal margins of the second, third, and fourth segments with a band of cinereous pubescence, attenuated in the middle.

Hab. Celebes.

Fam. DASYGASTRÆ.

1. *MEGACHILE INCISA*. *M. nigra*, rude et dense punctata, facie fulvo pubescente; alis fuscis, segmentis abdominis marginibus multo depressis.

Male. Length $5\frac{1}{2}$ lines. Black; closely and strongly punctured, the punctures confluent on the abdomen. The face clothed with fulvous pubescence. The tarsi obscurely rufo-piceous, the claws ferruginous; wings dark fuscous, their base hyaline. Abdomen: the apical margins of the segments smooth, impunctate, their basal margins very deeply depressed; a deep fovea at the tip of the apical segment; the head, thorax, and abdomen clothed beneath with short cinereous pubescence.

Hab. Celebes.

2. *MEGACHILE FULVIFRONS*. *M. nigra*, delicatule punctata; facie dense fulvo pubescente; thoracis lateribus abdomineque subtus fulvo pubescentibus; fasciis marginalibus abdominis fulvis.

Female. Length 7 lines. Black; head and thorax closely punctured, the abdomen delicately so and shining; the mandibles stout, with two acute teeth at their apex, shining and covered with oblong punctures; the face, sides of the thorax, and abdomen beneath, densely clothed with fulvous pubescence; the apical margins of the segments of the abdomen above with narrow fasciæ of short fulvous pubescence; the abdomen in certain lights has a metallic tinge.

The *male* is similarly clothed to the female, the margins of the segments are deeply depressed, and that of the apical segment slightly notched in the middle.

Hab. Celebes.

3. **MEGACHILE TERMINALIS.** *M. nigra*, capite thoraceque dense punctatis; abdomine pube nigra vestito; segmentis duobus apicalibus pube alba vestitis; alis fuscis.

Female. Length 9 lines. Black; the face with tufts of black pubescence above the insertion of the antennæ; mandibles very stout, with an acute tooth at their apex, the inner margin subdentate, and covered with fine cinereous pubescence. Thorax with black pubescence at the sides of the metathorax; the wings dark fuscous. Abdomen clothed with black pubescence; the fifth and sixth segments clothed with ochraceous pubescence above, that on the sixth nearly white.

Hab. Celebes.

This species resembles the *M. ornata*; but when viewed beneath, the different colour of the pollen-brush at once separates them.

Gen. CERATINA, Spin.

1. *Ceratina viridis*, Guér. *Icon. Reg. Ann.* 444. t. 73. f. 6.

Hab. India (Bengal, N. India), Ceylon, Celebes, China.

2. *Ceratina hieroglyphica*, Smith, *Cat. Hym. Ins.* ii. 226.

Hab. Northern India, Celebes, Philippine Islands, Hong Kong.

Fam. DENUATÆ.

1. **STELIS ABDOMINALIS.** *S. dense punctata*, capite thoraceque nigris, abdomine ferrugineo; alis nigro-fuscis violaceo iridescentibus.

Male. Length 5 lines. Head and thorax black, abdomen ferruginous; head and thorax strongly punctured, the scutellum very strongly so; the sides of the face and the anterior margin of the face fringed with white pubescence. The posterior margin of the scutellum rounded; wings dark brown with a violet iridescence. Abdomen ferruginous and closely punctured.

Hab. Celebes.

2. **CÆLIOXYX FULVIFRONS.** *C. nigra*, rude punctata, facie pube fulva vestita; alis fuscis cupreo iridescentibus.

Male. Length 6 lines. Black; the head and thorax with large con-

fluent punctures; the face clothed with fulvous pubescence. Thorax: a stout tooth on each side of the scutellum at its base; wings dark brown with a coppery effulgence, subhyaline at their base; beneath clothed with short cinereous pubescence. Abdomen: elongate, conical; closely punctured, with the apical and basal margins of the segments smooth; the apical segment with a tooth on each side at its base and four at its apex; beneath the margins of the segments fringed with pale pubescence; the apical margin of the fourth segment notched in the middle; the fifth entirely clothed with pale pubescence.

Hab. Celebes.

Fam. SCOPULIPEDES.

Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*, *Linn. Syst. Nat.* i. 955. 19.

Hab. India, Ceylon, Malacca, Sumatra, Borneo, Philippine Islands, Hong Kong, Shanghai, Celebes.

Gen. XYLOCOPA, *Latr.*

1. *Xylocopa fenestrata*, *Fabr. Syst. Piez.* p. 339. 6. ♂.

Hab. India, Celebes.

2. *Xylocopa æstuans*, *Linn. Syst. Nat.* 961. 53.

Hab. India, Java, Singapore, Celebes.

3. *Xylocopa Dejeanii*, *St. Farg. Hym.* ii. 209. 59.

Hab. Java, Borneo, Sumatra, Celebes.

4. *Xylocopa collaris*, *St. Farg. Hym.* ii. 189. 26.

Hab. India, Sumatra, Malacca, Borneo, Celebes.

5. *XYLOCOPA NOBILIS*. *X. nigra*, pube nigra induta; abdominis basi pube flava, apice lateritio.

Female. Length 11 lines. Black; a narrow line of pale fulvous pubescence on the margin of the thorax in front, a patch of the same colour on each side of the metathorax, and the basal segment of the abdomen covered above with similar pubescence; the apical margin of the third and fourth segments, and the fifth and six entirely, covered with bright brick-red pubescence; the wings black, with coppery iridescence.

Hab. Celebes.

Fam. SOCIALES.

1. *APIS ZONATA*. *A. nigra*, thoracis lateribus dense ochraceo pubescentibus; alis fumatis; abdomine nitido, segmentis secundo tertio quartoque basi niveo pubescentibus.

Worker. Length 8-8½ lines. Black; the head and thorax opaque, the abdomen shining; the clypeus smooth and shining, the flagellum rufo-piceous beneath; the anterior margin of the labrum narrowly,

and the apex of the mandibles, ferruginous; the face with a little fine short cinereous pubescence above the insertion of the antennæ; the vertex with long black pubescence; the eyes covered with short black pubescence. Thorax: the sides with ochraceous pubescence; wings smoky, the superior pair darkest at their anterior margin beyond the stigma. Abdomen: a snow-white band at the basal margin of the second, third, and fourth segments, the bands continued beneath, but narrower.

Hab. Celebes, Philippine Islands.

Specimens of this species denuded of their white bands would approach the *A. unicolor* of Latreille; but that insect is described as having the anterior wings black; in the present species both pairs are of the same smoky colour, not approaching black.

Fam. MUTILLIDÆ.

Gen. MUTILLA.

1. *Mutilla sexmaculata*, *Swed. Nov. Act. Holm.* viii. 286. 44. ♀.

Mutilla fuscipennis, *Fabr. Syst. Piez.* 436. 35. ♂.

Hab. India (Punjaub, &c.), China, Java, Celebes.

2. *Mutilla unifasciata*, *Smith, Cat. Hym.* pt. iii. p. 38.

Hab. India, Celebes.

3. *Mutilla rufogastra*, *St. Farg. Hym.* iii. 629. 51. ♂.

Hab. India, Celebes.

4. *MUTILLA VOLATILIS*. *M. nigra*, rude punctata et pubescens; capite abdomineque nitidis, alis fusco-hyalinis.

Male. Length 5-6 lines. Black. Head and thorax very coarsely punctured; head and disk of the thorax punctured; the metathorax opaque, with a central abbreviated channel and covered with large shallow punctures; the eyes notched on their inner margin; wings fuscous and iridescent; the tegulæ smooth and shining. Abdomen shining and rather finely punctured; the basal segment narrow and campanulate; the margins of the segments thickly fringed with silvery-white hair; the cheeks, sides of the thorax, and beneath the legs and abdomen with scattered long silvery-white hairs.

Hab. Celebes.

Fam. SCOLIADÆ, *Leach*.

Gen. SCOLIA, *Fabr.*

1. *Scolia erratica*, *Smith, Cat. Hym. Ins.* pt. iii. p. 88. 10.

Scolia verticalis, *Burm. Abh. Nat.-Ges. Halle*, i. 37. 61.

Hab. India, Sumatra, Celebes.

2. *Scolia aurulenta*, *Smith, Cat. Hym. Ins.* pt. iii. p. 102. 80. (nec *Fabr.*).

Hab. Philippine Islands, Celebes.

3. *Scolia fimbriata*, *Burm. Abh. Nat.-Ges. Halle*, i. p. 32. 24.
Hab. Java, Celebes.

4. *Scolia dimidiata*, *Guér. Voy. Coq. Zool.* ii. pt. 2. p. 248. ,
Hab. Senegal, Celebes.

5. *SCOLIA TERMINATA*. *S. nigra*, clypeo mandibulisque flavis, thorace flavo variegato, alis hyalinis, abdomine flavo quinque-fasciato, apicisque marginibus flavis.

Male. Length 5 lines. Black; the clypeus, labrum, and mandibles yellow; the former with a triangular black spot in the middle; the latter ferruginous at their apex. The posterior margin of the prothorax, the tegulæ, a transverse curved line on the scutellum, and a spot on the postscutellum yellow; the anterior and intermediate tarsi, tibiæ, and knees, and the posterior tibiæ outside, yellow; a black line on the intermediate tibiæ beneath, and the apical joints of the tarsi fuscous; wings hyaline, the nervures ferruginous. Abdomen brightly prismatic; the margins of all the segments with a narrow yellow fascia, those on the second and third segments terminating at the sides in a large rounded macula; the fascia very narrow or obliterated on the sixth segment; the fasciæ on the second and third segments continued beneath.

Hab. Celebes.

6. *SCOLIA AGILIS*. *S. nigra*, mandibulis clypeoque flavis, alis fulvo-hyalinis, abdomine prismatico flavo quadrifasciato.

Male. Length 8 lines. Black and punctured, with thin long griseous pubescence; the vertex, disk of the thorax, and the abdomen shining; the mandibles and clypeus yellow, the latter with a black bell-shaped spot in the middle; wings fulvo-hyaline, the nervures ferruginous; the tibiæ with a yellow line outside. Abdomen beautifully prismatic; the first and three following segments with a yellow fascia on their apical margins, the second and two following much attenuated in the middle, or the fourth interrupted.

Hab. Celebes.

7. *SCOLIA FULVIPENNIS*. *S. nigra*, antennis capiteque supra basin antennarum rubris, alis fulvo-hyalinis.

Male. Length 7 lines. Black; the antennæ and the head above their insertion ferruginous, the scape black, the head coarsely punctured. Thorax: coarsely punctured; the mesothorax with an abbreviated deeply impressed line in the middle of its anterior margin; wings fulvo-hyaline, the nervures ferruginous; the apex of the wings slightly fuscous, the anterior pair with two submarginal cells and one recurrent nervure. Abdomen: shining, punctured, and prismatic.

Hab. Celebes.

8. *SCOLIA ALECTO*. *S. nigra*, capite supra basin antennarum rubro; alis nigris violaceo micantibus.

Female. Length 14 lines. Black and shining; head red above the insertion of the antennæ, very smooth and glossy, with a few punctures at the sides of and in front of the ocelli; antennæ black; the mandibles with a fringe of ferruginous hairs on their inferior margin. Thorax: smooth on the disk, which has a few scattered punctures at the sides; the scutellum punctured and shining; the thorax in front and the metathorax with black pubescence, the latter widely emarginate at the verge of the truncation, the lateral angles produced; wings black with a bright violet iridescence. Abdomen punctured, with the middle of the second, third, and fourth segments smooth and shining in the middle; the first segment with a smooth shining carina at its base slightly produced forwards, the abdomen with a slight metallic lustre. The wings with one marginal and three submarginal cells, and one recurrent nervure.

Male. Smaller than the female, and differs in having the clypeus red and the red colour running down behind the eyes, the antennæ longer, and the abdomen with a bright metallic iridescence.

Hab. Celebes.

9. *SCOLIA MINUTA.* *S. nigra*, abdomine iridescente, segmentorum marginibus apicalibus flavo fasciatis, alis subhyalinis iridescentibus.

Male. Length 4 lines. Head and thorax black and shining, with scattered pale pubescence; the mandibles and clypeus yellow, the latter with an anchor-shaped black spot. Thorax: the posterior margin of the prothorax and the anterior and intermediate tibiæ and tarsi yellow; a minute yellow spot on the postscutellum yellow; the wings subhyaline, the nervures fusco-ferruginous. Abdomen: the apical margins of the segments with a narrow yellow border, the second and third uniting with a lateral spot; the sixth segment immaculate; the apex pale testaceous.

Hab. Celebes.

Fam. POMPILIDÆ, *Leach.*

1. *Pompilus analis*, *Fabr. Syst. Piez.* p. 209. 42.

Hab. India, Java, Ceylon, Celebes.

2. *POMPILUS SALTITANS.* *P. niger*, pedibus subferrugineis, prothoracis margine postica flava; alis flavo-hyalinis, apice fuscis, abdomine pilis cinereis fasciato.

Female. Length 6 lines. Black and thinly covered with ashy pile. The scape, labrum, mandibles and palpi ferruginous; the clypeus widely emarginate anteriorly. The posterior margin of the prothorax angular and with a yellow border; the scutellum prominent, covered on each side with a dense silvery-white pile, the postscutellum with two spots of the same; the wings flavo-hyaline, their apex with a broad dark-fuscous border, the nervures ferruginous, the tegulæ yellow; the posterior wings palest; legs pale ferruginous, the coxæ black with

their tips pale; the apical joints of the tarsi blackish, the spines of the legs black. Abdomen: the first, second, and third segments with a fascia of silvery-white pile at their basal margins; the apex of the abdomen ferruginous.

Hab. Celebes.

3. *POMPILUS CONTORTUS*. *P. niger*, cinereo-pilosus, prothorace flavo postice marginato; alis subhyalinis, marginibus apicalibus fuscis, pedibus subferrugineis.

Female. Length $5\frac{1}{2}$ lines. Black; the head, thorax, and four basal segments of the abdomen covered with ashy pile; the first and second segments with their apical margins naked. The scape yellow in front; the flagellum beneath, the labrum, mandibles and palpi ferruginous; the joints of the antennæ arcuate, particularly the apical ones; the apex of each joint is oblique, giving the antennæ a twisted appearance. Thorax: the posterior margin of the prothorax angular and with a broad yellow border; the scutellum compressed and prominent; wings subhyaline with a broad fuscous border at their apex, the tegulæ yellow; legs pale ferruginous, with their coxæ and trochanters black; the apical joints of the tarsi fuscous. Abdomen with a yellow macula at the tip.

Hab. Celebes.

4. *POMPILUS PILIFRONS*. *P. niger*, facie argenteis pilis dense tecta; thorace abdomineque flavo maculatis, alis subhyalinis, apice fuscis.

Female. Length $4\frac{1}{2}$ lines. Black; the face densely covered with silvery-white pile; a narrow line at the inner orbits of the eyes, the palpi and mandibles yellow; the latter ferruginous at their apex. The posterior margin of the prothorax rounded and yellow; a minute yellow spot on the mesothorax touching the scutellum, the thorax and abdomen covered with a changeable silky pile; the wings subhyaline, their nervures fuscous, a broad dark fuscous border at the apex of the superior pair. A transverse spot on each side of the basal margin of the second and third segments, and an emarginate fascia on that of the fifth, yellow.

5. *POMPILUS DECEPTOR*. *P. rufescenti-flavus*; vertice nigro, alis antice apice fuscis.

Male. Length 6 lines. Pale reddish-yellow; the antennæ slightly dusky above; a black transverse stripe on the vertex between the eyes, and another issuing from it in the middle and passing beyond the ocelli. Thorax: a black stripe on each side of the mesothorax over the tegulæ; the wings subhyaline, the nervures ferruginous, the superior pair fuscous at their apex. Abdomen immaculate.

Subgenus *PRIOCNEMIS*.

1. *PRIOCNEMIS RUFIFRONS*. *P. niger*; facie, antennis, tibiis tarsisque

ferrugineis, alis fulvo-hyalinis; abdominis segmento apicali flavo unimaculato.

Female. Length $9\frac{1}{2}$ lines. Black; the face above the clypeus, as high as the anterior ocellus, reddish-yellow; the extreme edge of the clypeus, the labrum and base of the mandibles ferruginous; the antennæ reddish-yellow. Thorax: fulvo-hyaline, with a dark fuscous border at the apex; the knees, tibiæ and tarsi reddish-yellow; the two latter spinose. Abdomen: gradually tapering to an acute point at the apex, the sixth segment with an elongate red spot.

Hab. Celebes.

Subgenus AGENIA.

1. *Agencia blanda*, Guér. *Voy. Coq. Zool.* ii. pt. 2. p. 260.

2. *AGENCIA BIMACULATA.* *A. nigra*, cinereo-pilosa, clypeo plagis duabus flavis; antennarum articulis apicalibus, tibiis tarsisque anticis et intermediis femoribusque posticis ferrugineis; alis subhyalinis, nervuris nigris.

Female. Length 7 lines. Black, and covered with ashy pile; a large macula on each side of the clypeus, the mandibles and palpi yellow; the base and apex of the mandibles rufo-piceous; the flagellum pale ferruginous, more or less fuscous above towards the base. Thorax: the posterior margin of the prothorax arched; the anterior and intermediate tibiæ and tarsi and the femora at their apex beneath, also the posterior femora, pale ferruginous; the wings subhyaline, the nervures dark fuscous. Abdomen: the apical margins of the segments obscurely and narrowly rufo-piceous, the apex ferruginous.

Hab. Celebes.

Gen. MACROMERIS, St. Farg.

1. *Macromeris splendida*, St. Farg. *Hym.* iii. 463. 1. ♂.

Hab. India, China, Malacca, Borneo, Java, Celebes.

Gen. MYGNIMIA, Smith.

1. *Mygnimia iridipennis*, Smith, *Journ. Proc. Linn. Soc.* ii. p. 98.

Hab. Celebes, Borneo.

This insect, a female, is 5 lines larger than *M. iridipennis*; but I can point out no other distinction beyond a slight difference in the colour of the wings: the specimen from Borneo has a metallic bluish-green iridescence, the Celebes insect has a violet iridescence; notwithstanding which I am inclined to regard them as one species.

2. *MYGNIMIA FUMIPENNIS.* *M. aurantiaco-rubra*, alis obscure fuscis.

Female. Length 9 lines. Orange-red; the anterior margin of the clypeus entire; the labrum produced, its anterior margin widely emarginate; eyes large, black and ovate. Thorax: the posterior margin

of the prothorax rounded; the mesothorax with a longitudinal fuscous stripe on each side, widest anteriorly; the metathorax truncate; above, transversely striate; the tibiæ and tarsi spinose; wings dark fuscous, with a pale semitransparent macula at the base of the second discoidal cell and a dark fuscous macula beyond; the insect entirely covered with a fine orange-red downy pile.

Hab. Celebes.

Fam. SPIEGIDÆ.

1. *SPHEX PRÆDATOR*. *S. niger*, rude punctatus, facie pube fulva vestita; alis fuscis cupreo iridescentibus.

Male. Length $10\frac{1}{2}$ lines. Black; the head and thorax opaque. Abdomen shining blue-black. The face with silvery pile on each side of the clypeus, and sprinkled with erect black hairs. Thorax: the posterior margin of the prothorax with a line of silvery pubescence; the metathorax with a short light-brown pubescence at the apex, and thinly clothed with black hairs; wings dark brown, with a brilliant violet iridescence. Abdomen blue-black, smooth and shining.

Hab. Celebes.

2. *AMMOPHILA INSOLATA*. *A. nigra*, scapo mandibulis, pedibus, abdominisque segmentis primo et secundo ferrugineis; alis subhyalinis.

Female. Length $8\frac{1}{2}$ lines. Black; the scape, the base of the flagellum beneath, the anterior margin of the clypeus and the mandibles ferruginous; the latter black at their apex. Thorax: the prothorax smooth and shining; the meso- and metathorax above transversely striated, the scutellum longitudinally so; the legs ferruginous, with their coxæ black; a spot of silvery-white pubescence on each side of the metathorax at its base, and two at its apex close to the insertion of the petiole; the wings fulvo-hyaline with the nervures ferruginous. Abdomen: the petiole and the following segment red, the base of the third also slightly red; the three apical segments obscurely blue, with a thin glittering pile.

The *male* differs in having the legs black, their articulations only being ferruginous; the head entirely black with the face densely covered with silvery-white pile. The thorax is sculptured as in the other sex; the petiole more elongate and slender, the basal joint black, the second and the first segment ferruginous beneath; the rest of the abdomen blue.

Hab. Celebes.

Gen. PELOPÆUS, *Latr.*

1. *Pelopæus Madraspatanus*, *Fabr. Syst. Piez.* p. 203. 3.

Hab. Malabar, Madras, Nepaul, Bengal, Celebes.

2. *Pelopæus Bengalensis*, *Dahlb. Syst. Nat.* i. 941. 2.

Hab. India, Philippine Islands, China, Isle of France, Celebes.

3. *PELOPEUS INTRUDENS*. *P. niger*; clypeo bidentato, tibiis anticis et intermediis, femorumque apice, femoribusque posticis basi, trochanteribus, tibiarum dimidio basali, petioloque rufescenti-flavis; alis fulvo-hyalinis.

Female. Length 11 lines. Black; the face with silvery pubescence; the clypeus with two large blunt teeth at its apex, formed by a deep notch in its anterior margin; the scape reddish-yellow in front. The meso- and metathorax transversely striated; the wings fulvo-hyaline, the nervures ferruginous; the anterior and intermediate tibiæ and the femora at their apex, the posterior femora at their base, the trochanters, the tibiæ with their basal half and the middle of the basal joint of the posterior tarsi, reddish-yellow; the petiole of the abdomen of a paler yellow; the abdomen smooth and shining. The male only differs in being rather smaller.

Hab. Celebes.

Mr. Wallace says of this species, "A common house-wasp in Macassar; builds mud cells on rafters."

Note.—In describing the species of this genus collected by Mr. Wallace at Borneo, I incorrectly gave that locality for *P. javanus*. The insect mistaken for that species may be shortly characterized as *P. benignus*, length 12 lines. Opaque-black, with the petiole shining; the metathorax transversely striated; the wings pale fulvo-hyaline, the nervures ferruginous; the scape in front, the anterior and intermediate tibiæ, the apex of the femora, and the basal joint of the tarsi reddish-yellow; the posterior legs, with the trochanters and basal half of the femora, yellow.

4. *PELOPÆUS FLAVO-FASCIATUS*. *P. niger*; capite thoraceque flavo variegato; pedibus abdominisque basi ferrugineis; alis hyalinis, apice fuscis, abdominisque segmento tertio fascia lata flava ornato.

Female. Length 9 lines. Black; the clypeus yellow; the mandibles and scape ferruginous, the former black at their base, the latter yellow in front; the sides of the face with a bright golden pile. Thorax: the posterior margin of the prothorax, the tegulæ, scutellum, and a quadrate spot on each side of the metathorax at its base yellow; the legs ferruginous, with the coxæ, trochanters, and claw-joint of the tarsi black; wings fulvo-hyaline, the nervures ferruginous, a fuscous spot at the apex of the anterior pair; the meso- and metathorax transversely striated, the latter with a yellow spot at the insertion of the petiole. Abdomen: the petiole slightly curved upwards, the first segment ferruginous; a broad yellow fascia at the apex of the third segment, the apex of the fourth with a narrow obscure fascia; the abdomen covered with a fine silky pile.

Hab. Celebes.

Fam. BEMBICIDÆ, *Westw.*

1. *Bembex trepanda*, *Dahlb. Hym. Europ.* i. p. 181.

Hab. India, Celebes.

Fam. LARRIDÆ.

Genus LARRA, *Fabr.*

1. *Larra prismatica*, *Smith, Journ. Proc. Linn. Soc.* ii. p. 103.

Hab. Malacca, Celebes.

Genus LARRADA, *Smith.*

1. *Larrada aurulenta*, *Smith, Cat. Hym. Ins.* pt. iv. 276. 6.

Sphex aurulenta, *Fabr. Mant.* i. 274. 10.

Hab. India, Java, Sumatra, Celebes, Philippine Islands, China, Cape of Good Hope, Gambia.

2. *Larrada exilipes*, *Smith, Cat. Hym. Ins.* pt. iv. p. 278.

3. *LARRADA ÆDILIS.* *L. nigra*; facie argenteo-pilosa, alis subhyalinis, articulis apicalibus tarsorum rufo-testaceis, abdomine lævi et nitido.

Female. Length $5\frac{1}{2}$ lines. Black; head and thorax subopaque, the abdomen shining; the face densely covered with silvery pile, the cheeks, sides of the thorax and abdomen thinly so; the tips of the mandibles and apical joints of the tarsi ferruginous, the latter obscurely so. The metathorax transversely and rather finely rugose, the truncation more strongly striated; the scutellum shining; the wings subhyaline, the nervures ferruginous; the tibiæ with scattered spines, the tarsi spinose.

4. *LARRADA AURIFRONS.* *L. nigra*; facie mesothoracis metathoracisque lateribus aurato pubescentibus, abdominis marginibus segmentorum trium basalium argentato piloso fasciatis; alis fuscis.

Male. Length 8 lines. Black; the face and outer orbits of the eyes clothed with golden pile; the lateral margins of the mesothorax and the metathorax thinly clothed with golden pile; wings dark fuscous with a violet iridescence; the three basal segments of the abdomen with fasciæ of silvery pile.

Hab. Celebes.

5. *LARRADA PERSONATA.* *L. capite thoraceque nigris, abdomine ferrugineo.*

Female. Length $8\frac{1}{2}$ lines. Head, thorax, and legs black; the two former closely punctured and thinly covered with short cinereous pubescence; the metathorax with the punctures running into transverse striæ in the middle; the sides of the thorax and the legs with a fine silky silvery-white pile; the tibiæ and tarsi strongly spinose; wings fusco-hyaline; abdomen entirely red, smooth and shining.

The *male* is smaller, and has the four apical segments of the abdomen black, the face, cheeks, and apical margins of the segments of the abdomen with silvery pile.

Hab. Celebes.

This is probably merely a variety of *L. simillima*, wanting the black apex to the abdomen; it very much resembles the *L. anathema* of Europe.

6. LARRADA RUFIPES. *L. nigra*, mandibulis pedibusque rufis; alis hyalinis, venis pallide testaceis; abdomine sericeo-piloso.

Female. Length 7 lines. Black; the head smooth and shining; the clypeus, the cheeks, and face anteriorly, covered with silvery pile; the scape in front, the mandibles, and palpi ferruginous. Thorax: the sides and beneath with a thin silvery-white pile; the legs ferruginous with the coxæ black, the posterior pair red beneath; the thorax closely punctured, the metathorax transversely striated; wings fulvo-hyaline, the nervures pale-testaceous. Abdomen shining, very closely and delicately punctured; thinly covered with a fine white silky pile, which is very bright on the margins of the segments, which are slightly rufo-piceous.

The *male* closely resembles the female, and is similarly sculptured and coloured.

Hab. Celebes.

7. LARRADA FESTINANS. *L. nigra*; facie abdominisque marginibus segmentorum argentato-pilosis.

Female. Length 3 lines. Black; the face and cheeks thinly covered with silvery pile. Thorax: the disk very closely punctured, the metathorax rugose; the sides and the legs with a fine glittering sericeous pile, the wings subhyaline, their apical margins fuscous, the nervures fuscous. Abdomen smooth and shining, covered with a thin silky pile, the apical margins with bright silvery fasciæ, only observable in certain lights.

The *male* closely resembles the female, but has the face more silvery.

Hab. Celebes.

Genus MORPHOTA, *Smith*.

1. MORPHOTA FORMOSA. *M. capite thoraceque nigris*; abdomine rufo, apice nigro, pilis argentatis ornato.

Female. Length 5 lines. Black, with the two basal segments of the abdomen red; covered with a brilliant changeable silvery pile, most dense on the face, cheeks, sides of the metathorax, and on the apical margins of the abdominal segments. The mandibles ferruginous, with their apex piceous. The vertex smooth, and having *three distinct ocelli*; the head more produced behind the eyes than in *Larrada*. Thorax: the prothorax subtuberculate at the sides; wings subhyaline and iridescent, the nervures fuscous, the tegulæ pale testaceous behind. The apical margin of the first segment of the abdomen rufo-fuscous.

Hab. Celebes.

The insects belonging to the genus *Morphota* differ from those of *Larrada* in having three distinct ocelli, the vertex without any depres-

sions, and the head much less compressed than in *Larrada*; the recurrent nervures are received nearer to the base and apex of the second submarginal cell; the species have, in fact, a distinct habit, and do not assimilate with the species of *Larrada*.

Genus TACHYTES, *Panz.*

1. TACHYTES MOROSUS. *T. niger*, scutello abdomineque nitidis, facie argenteo-pilosa; marginibus lateralibus abdominis segmentorum argentatis.

Female. Length $4\frac{1}{2}$ lines. Black; the face covered with silvery pile; the thorax finely and very closely punctured; the metathorax opaque and finely rugose, thinly covered with cinereous pubescence; the anterior tarsi ciliated on the exterior, and the intermediate and posterior tibiæ with a few dispersed spines; wings fusco-hyaline and iridescent, the nervures fusco-ferruginous, the costal nervure black. Abdomen smooth and shining; the apical margins of the intermediate segments slightly depressed, with the sides sericeous.

Fam. CRABRONIDÆ.

Genus OXYBELUS, *Latr.*

1. *Oxybelus agilis*, *Smith, Cat. Hym. Ins.* pt. iv. 387. 25.
Hab. India, Celebes.

Genus CRABRO, *Latr.*

1. CRABRO (RHOPALUM) AGILIS. *C. obscu-ro-nigra*, clypeo argentato, capite, thorace abdomineque flavo variis.

Female. Length 4 lines. Black, opaque; head larger than the thorax, quadrate; the ocelli in a curve on the vertex; the clypeus and lower portion of the cheeks with silvery pile; the scape, two basal joints of the flagellum, the palpi, and the mandibles, yellow; the latter rufo-piceous at their apex. The margin of the prothorax, the tubercles, the scutellum, the tibiæ and tarsi, the anterior femora and the intermediate pair at their apex yellow; the anterior femora black above; the wings subhyaline and iridescent, the nervures testaceous. Abdomen: with an elongate clavate petiole; the first segment with an oblique yellow macula on each side, the third with a large lateral macula at its base, and the following segments entirely yellow.

Hab. Celebes.

This species closely resembles the *C. Westermanni* of Dahlbome, from the Cape of Good Hope.

Genus CERCERIS, *Latr.*

1. *Cerceris instabilis*, *Smith, Cat. Hym. Ins.* pt. iv. 452. 74.
Hab. India, China, Celebes.

2. *Cerceris unifasciata*, *Smith, Cat. Hym. Ins.* pt. iv. 456. 84.

Hab. North China, Celebes.

3. *Cerceris fuliginosa*, *Smith, Cat. Hym. Ins.* pt. iv. 454. 79.

Hab. Celebes.

4. *CERCERIS VARIPES*. *C. nigra*, facie flavo varia; alis fuscis basi hyalinis; pedibus variegatis; abdomine flavo maculato.

Male. Length 6 lines. Black; a line down the inner orbits of the eyes, continued along the lower margins of the face, and uniting with the clypeus, which as well as a line above it between the antennæ are yellow; a spot on the scape in front, and the mandibles, yellow; the latter rufo-piceous at their apex. Thorax: a spot on each side of the prothorax, a minute one on the tegulæ, the postscutellum, the intermediate and posterior coxæ and trochanters, the anterior tibiæ behind, the femora beneath, and the intermediate and posterior tibiæ yellow; the femora reddish above and at their articulations; the posterior femora and tibiæ black, with the tarsi rufo-testaceous; the anterior wings and the apex of the posterior pair brown, the base of the anterior pair hyaline. Abdomen: the second and three following segments with a short yellow stripe on each side.

Hab. Celebes.

Tribe VESPIDÆ.

Fam. EUMENIDÆ, *Westw.*

Genus ZETHUS, *Fabr.*

1. *Zethus cyanopterus*, *Sauss. Mon. Guêpes Sol.* i. 23. 2.

Genus MONTEZUMIA, *Sauss.*

1. *Montezumia Indica*, *Sauss. Mon. Guêpes Sol.* i. *supp.* 167. 59. t. 9. f. 4.

Hab. India, Celebes.

Genus RHYNCHIUM, *Spin.*

1. *Rhynchium hæmorrhoidale*, *Sauss. Mon. Guêpes Sol.* i. 109. 12.

Vespa hæmorrhoidalis, *Fabr. Syst. Piez.* p. 259. 28.

Hab. India, Java, Cape of Good Hope, Celebes.

2. *Rhynchium argentatum*, *Sauss. Mon. Guêpes Sol.* i. 115. 22.

Vespa argentata, *Fabr. Syst. Piez.* p. 260. 39.

Hab. India, Celebes.

3. *Rhynchium atrum*, *Sauss. Mon. Guêpes Sol.* i. 109. 11.

Hab. India, Celebes.

4. *Rhynchium parentissimum*, *Sauss. Mon. Guêpes Sol.* p. 111. 14.—

Var. R. hæmorrhoidale?

Hab. India, Java, Celebes.

Genus EUMENES.

1. *Eumenes circinalis*, *Fabr. Syst. Piez.* p. 286. 4.

Hab. India, Sumatra, Celebes.

2. *Eumenes fulvipennis*, *Smith, Cat. Hym. Ins.* pt. v. 24. 26.

Hab. Celebes.

3. EUMENES VINDEX. *E. niger*, flavo variegatus, alis subhyalinis iridescentibus.

Male. Length 6 lines. Black; strongly punctured and shining; a minute spot behind the eyes, another in their emargination, the clypeus, with two minute spots above it, a spot at the base of the mandibles, and the scape in front yellow. Thorax: a subinterrupted line on its anterior margin, the tubercles, a spot on the tegulæ behind, and the legs yellow; the coxæ, femora at their base, and the posterior tibiæ outside dusky; wings light brown and iridescent, the anterior margin of the superior pair darkest. Abdomen delicately punctured; the apical margin of the first segment with a narrow yellow border slightly interrupted on each side; the apical segments with a thin cinereous pile.

Hab. Celebes.

4. EUMENES ARCHITECTUS. *E. niger*, clypeo, prothoracis margine postscutello abdominisque segmenti primi margine flavis.

Female. Length 6 lines. Black and closely punctured; a line behind the eyes near their vertex, a spot between the antennæ and the clypeus, yellow; the latter black at the apex, which is notched; the labrum and mandibles reddish-yellow, the latter black at their base. Thorax: the anterior margin yellow; the tubercles, tegulæ, post-scutellum, an interrupted line on each side of the metathorax, the tibiæ, tarsi, and femora at their apex, yellow; the coxæ spotted with yellow and the posterior tibiæ dusky; the wings fusco-hyaline; a black line across the tegulæ. Abdomen: an ovate spot on each side of the petiole, its apical margin, a transverse ovate spot on each side of the first segment, and its posterior margin yellow; the following segments covered with a grey silky pile.

Male. Differs from the female in having the clypeus entirely yellow, the metathorax and abdomen entirely black; only the apical margin of the petiole is yellow, it is also longer.

Hab. Celebes.

5. EUMENES FLORALIS. *E. niger*; clypeo flavo; thorace pedibusque ferrugineo-flavo variegatis.

Male. Length $6\frac{1}{2}$ lines. Black; strongly punctured and shining; the clypeus and a spot above yellow; a narrow abbreviated line behind the eyes, a minute spot in their emargination, and the tips of the mandibles orange-red; the flagellum fulvous beneath. Thorax: the anterior and posterior margin of the prothorax, the tubercles, and a

spot on the tegulæ behind, a line on the postscutellum and the legs, orange-red, the coxæ black, and the tarsi dusky; the wings slightly brownish with a violet iridescence. Abdomen immaculate, with a minute spot on the posterior border of the petiole; the third and following segments with a fine cinereous pile.

Hab. Celebes.

Genus ODYNERUS, *Latr.*

1. *Odynerus ovalis*, *Sauss. Mon. Guêpes Sol.* 215. 122. t. 19. f. 4.

Hab. India, China, Celebes.

2. ODYNERUS (ANCISTROCERUS) CLAVICORNIS. *O. niger*, flavo varius; capite thoraceque fortiter, abdomine delicatule punctatis, antennis clavatis.

Male. Length $4\frac{1}{2}$ lines. Black; head and thorax strongly punctured and shining; a spot on the mandibles, the labrum, the clypeus, a spot above, the scape in front, a line in the emargination of the eyes and a spot behind them, yellow; the flagellum broadly clavate, the joints transverse, the apex of the club and the terminal hook reddish-yellow, the thickened part of the club concave beneath, the hook bent into the cavity. Thorax: two spots on the anterior margin, a spot on the tegulæ in front, and the legs, reddish-yellow, the coxæ dusky; the metathorax coarsely rugose and deeply concave-truncate. Abdomen: the first segment with a transverse carina at its base, in front of which is an irregularly cut deep transverse channel forming a second carina in front of the groove; the segments finely punctured, the first and second segments with a yellow posterior border, the fourth and following segments rufo-piceous.

Hab. Celebes.

3. ODYNERUS (LEIONOTUS) INSULARIS. *O. niger*, flavo et aurantio variegatus; abdominis basi ferruginea.

Male. Length 6 lines. Black; the head and thorax strongly punctured; the mandibles, clypeus, a line above extending to the anterior ocellus, the emargination of the eyes, a spot at their vertex and a line at their outer orbits, yellow; the antennæ reddish-yellow, with the scape pale yellow in front and a narrow fuscous line above; the yellow marking more or less stained orange. Thorax: the prothorax orange, its anterior border, the tubercles, tegulæ, two spots on the scutellum and postscutellum, the lateral margins of the metathorax and the legs, yellow, the latter with reddish stains; wings subhyaline, the superior pair with a fuscous cloud at their apex. The base of the abdomen and a large macula on each side of the second segment ferruginous; the apical margin of the segments with a yellow border, the first and second with a minute notch in the middle; the first and second segments entirely ferruginous beneath.

4. *ODYNERUS FULVIPENNIS*. *O. niger*, *flavo varius*, *pedibus ferrugineis*, *alis fulvo-hyalinis*.

Male. Black; head and thorax closely and strongly punctured; the clypeus and two spots above, a line along the lower margin of the sinus of the eyes, a narrow line behind them, the scape in front, and the mandibles yellow; the tips of the latter rufo-piceous; the antennæ and legs ferruginous; an interrupted yellow line on the anterior margin of the thorax; the wings fulvo-hyaline; the veins which enclose the marginal and second and third submarginal cells fuscous, the rest pale testaceous; a fuscous cloud in the marginal cell. Abdomen: the apical margin of the second segment with a yellow fascia, the following segments with red fasciæ.

Hab. Celebes.

Genus *ICARIA*, *Sauss.*

1. *Icaria ferruginea*, *Sauss. Mon. Guêpes Soc.* p. 37. 15.

Hab. India, Celebes.

2. *ICARIA PILOSA*. *I. nigra*, rude punctata et densissime pubescens, clypeo flavo, thorace, pedibus abdomineque ferrugineo variegatis; alis subhyalinis, anticis apice fusco maculatis.

Male. Length $7\frac{1}{2}$ lines. Black; closely and strongly punctured; the clypeus, a line on the mandibles, and the scape in front, yellow; tips of the mandibles, the scape above, and the base of the flagellum ferruginous. Thorax: the prothorax, scutellum and postscutellum, ferruginous; the tegulæ and legs pale ferruginous, the coxæ black; wings fusco-hyaline, with a dark cloud in the marginal cell extending to the apex of the wing; a fainter cloud traverses the margin of the wing to its base. Abdomen: the first, second and third segments with a reddish-yellow fascia, that on the second segment continued beneath; a longitudinal broad stripe of the same colour on each side of the second segment; its apical margin serrated.

Hab. Celebes.

Genus *POLISTES*, *Latr.*

1. *Polistes sagittarius*, *Sauss. Mon. Guêpes Soc.* p. 56. 12.

Various specimens from Greece and Celebes have the thorax more or less ferruginous.

Hab. India, Celebes, China, Greece.

2. *Polistes Picteti*, *Sauss. Mon. Guêpes Soc.* 69. 28. t. 6. f. 8.

Hab. Ceram, Australia, Celebes.

3. *Polistes fastidiosus*, *Sauss. Mon. Guêpes Soc.* p. 60. 18.

Hab. Africa (Gambia), Celebes.

4. *Polistes stigma*, *Fabr. Syst. Piez.* p. 261. 41.

Hab. India, Ceram, Celebes.

5. *Polistes Philippinensis*, *Sauss. Mon. Guêpes Soc.* 58. 14 (var.).

Hab. Philippine Islands.

Genus *VESPA*, *Linn.*

1. *Vespa affinis*, *Fabr. Syst. Piez.* p. 254. 6 (var. *V. cincta*?).

Hab. India, China, Singapore, Celebes.

2. *VESPA FERVIDA*. *V.* nigra, delicatule punctata; clypei margine antica, macula pone oculos, margineque postica segmenti primi abdominis flavis; alis fulvo-hyalinis.

Female. Length 13 lines. Black; closely and finely punctured; the clypeus convex and strongly punctured, emarginate anteriorly, the emargination with a yellow border; the eyes extending to the base of the mandibles, which have three stout teeth at their apex and a narrow yellow line at their inner margin. Thorax: the postscutellum yellow, and a minute yellow spot on the outer margin of the tegulæ; the wings rufo-hyaline, darkest along the anterior margin of the superior pair; the nervures ferruginous, gradually becoming darker at the base of the wings, the costal nervure black.

Worker. Length 9 lines. Very closely resembles the female, but in addition to the yellow markings of that sex has the anterior margin of the clypeus yellow, a narrow transverse line between the antennæ, another along the lower margin of the notch of the eyes, an abbreviated stripe behind them at the base of the mandibles, a spot beneath the postscutellum and a narrow yellow line along the posterior margin of the basal segment of the abdomen.

Hab. Celebes.

Fam. TENTHREDINIDÆ.

Genus *TENTHREDO*, *Linn.*

1. *TENTHREDO* (*ALLANTUS*) *PURPURATA*. *T.* capite thoraceque cæruleo-viridibus, abdomine purpureo, alis fuscis iridescentibus.

Size, length 4 lines. Head and thorax blue-green, abdomen purple; wings dark fuscous with a violet iridescence; an oblique white line on each side beneath the scutellum; legs and antennæ black.

Hab. Celebes.

Fam. ICHNEUMONIDÆ.

Genus *MEGISCHUS*, *Brullé.*

1. *Megischus indicus*, *Westw. Trans. Ent. Soc.* new ser. i. 1851.

Hab. Philippine Islands, Celebes.

Genus *MESOSTENUS*, *Brullé.*

1. *MESOSTENUS ALBO-SPINOSUS*. *M.* niger, albo varius, abdominis segmentis albo marginatis, metathorace spinis duabus albis armato.

Female. Length $5\frac{1}{2}$ lines. Black; a half-circular spot on the clypeus, a heart-shaped one above it, a spot at the base of the mandibles, the orbits of the eyes, interrupted at their vertex, yellowish white, the palpi of the same colour, and a broad incomplete annulus on the

antennæ beyond their middle. Thorax: the mesothorax with two deeply impressed oblique lines inclined inwards and terminating at an ovate spot in the middle of the disk, the scutellum and an oblique line on each side a little before it, a horseshoe-shaped spot in the middle of the metathorax, and a little below it on each side a conical tooth, yellowish white; four spots beneath the wings, one on each side of the metathorax, and the coxæ beneath, white; the legs ferruginous, with the intermediate pair dusky behind, the posterior pair entirely so, the femora being black; the wings hyaline, nervures fuscous. Abdomen: punctured and with a white fascia on the margins of the three basal segments; the two apical segments with very narrow fasciæ.

Hab. Celebes.

This species is closely allied to the *M. literatus* of Brullé; but it differs too much, I think, to be identical with it.

2. *PIMPLA TRIMACULATA*. *P. flava*, oculis, macula circa ocellos, vittulis tribus mesothoracis setisque caudalibus nigris.

Female. Length 6 lines. Yellow; the antennæ fuscous above, also a fuscous cloud at the apex of the anterior wings, the wings hyaline with the nervures black; a spot on the scape within, and three longitudinal stripes on the mesothorax, black; the latter slightly punctured anteriorly; the metathorax smooth and shining, with three oblique carinæ on each side, and a small subovate enclosed space in the middle of the disk. Abdomen punctured, all the segments margined at their apex, and each with a deeply impressed line at their extreme lateral margins; the sixth segment with two minute black spots at its basal margin, the two apical segments smooth and shining; the ovipositor black.

Hab. Celebes.

This species is closely allied to the *P. trilineata* of Brullé.

Fam. BRACONIDÆ.

1. *BRACON INSINUATOR*. *B. capite, thorace pedibusque ferrugineis; antennis, tibiis tarsisque posticis et abdomine nigris; alis nigro-fuscis, macula hyalina sub stigmatæ.*

Female. Length $7\frac{1}{2}$ lines. Head and thorax smooth, shining, and ferruginous, the legs ferruginous, with the posterior tibiæ and tarsi black; the antennæ black, with the scape and following joint ferruginous; wings dark brown, with their extreme base pale testaceous; a hyaline stripe runs from the stigma across the first submarginal cell and passes a little below it. Abdomen black, smooth, and shining, with the lateral margins of the basal segment pale yellow-testaceous; this segment has on each side a longitudinal carina, and between them is a highly polished bell-shaped form; the second segment with deep oblique depressions at the sides, and deeply

longitudinally rugose-striate, leaving the apical margin smooth and shining; the second segment is similarly sculptured, and the third has a transverse groove at its base.

Hab. Celebes.

2. *BRACON INTRUDENS*. *B. rufescenti-flavus*, antennis setisque caudalibus nigris; alis nigro-fuscis, basi fasciaque angusta transversa flavis.

Female. Length 9 lines. Pale reddish-yellow; the eyes, flagellum, and ovipositor black; the scape and the following segment yellow; the head and thorax smooth and shining, both pubescent at the sides and beneath, the legs covered with a similar pale pubescence; the face with an upright horn between the antennæ, and a raised flattened plate in front of it. Abdomen: the basal segment with the lateral margins raised, and having on each side an elongate broad depression extending its entire length; the three following with an oblique depression on each side at the base of the segment; the third, fourth, and fifth segments distinctly margined at their apex; the ovipositor the length of the insect.

Hab. Celebes.

Genus AGATHIS, *Latr.*

1. *AGATHIS SCULPTURALIS*. *A. nigra*, prothorace, pedibus anticis mediisque ferrugineis; abdomine lævigato nitido.

Male. Length $5\frac{1}{2}$ lines. Black; the mouth, prothorax, anterior and intermediate legs, ferruginous; the face with two teeth or horns between or a little before the insertion of the antennæ, and another at the side of each, close to their insertion. Thorax: the mesothorax with two deeply impressed lines in front, running inwards, and uniting about the middle, and with two or three deep transverse channels before their junction; the lateral margins of the mesothorax deeply impressed; the metathorax ruggedly sculptured; the posterior coxæ and femora closely punctured; wings black with a hyaline spot in the first submarginal cell. Abdomen very smooth and shining, with a deeply impressed line on each side of the basal segment.

Hab. Celebes.

2. *AGATHIS MODESTA*. *A. rufescenti-flava*; antennis, vertice, tibiis posticis apice, tarsisque nigris; alis fusco maculatis.

Female. Length 4 lines. Reddish-yellow: the antennæ and vertex, black. The mesothorax with two deeply impressed longitudinal oblique lines, and two parallel ones between them; the metathorax reticulated; wings hyaline, with a dark fuscous stain crossing the anterior pair at the base of the first submarginal cell, these hyaline to the middle of the stigma, beyond which they are fuscous; a subhyaline spot at the apex of the marginal cell, and another beneath it at the inferior margin of the wing; the posterior tarsi dusky, and the tips of the tibiæ black.

Hab. Celebes.

3. *AGATHIS NITIDA*. *A. nigra, nitida*; facie, pectore, pedibus anticis et intermediis, plaga infra alas, scutelloque pallide ferrugineis.
Length 4 lines. Black and shining; the face, mandibles, head beneath, legs, pectus, sides of the thorax beneath the wings, the scutellum and the basal half of the abdomen beneath, pale ferruginous; the mesothorax with two longitudinal oblique lines on the disk, which have two parallel ones between them; the metathorax coarsely rugose; the wings dark brown, with the base of the stigma pale, and a hyaline spot beneath it. Abdomen very smooth and shining, with the apical margins of the segments narrowly rufo-piceous; the posterior legs incrassate and dark rufo-piceous.

Fam. CHRYSIDIDÆ.

Genus HEDYCHRUM, *Latr.*

1. *HEDYCHRUM FLAMMULATUM*. *H. viridi-purpureo lavatum*; capite thoraceque fortiter, abdomine delicatule, punctatis; alis fuscis basi hyalinis.

Length 3 lines. Bright green; the vertex, two oblique stripes on the prothorax, meeting in the centre of its anterior margin, a broad longitudinal stripe on the disk of the mesothorax, and the sides of the scutellum and postscutellum deep purple. Abdomen: the middle of the basal segment, the second and third segments at their base, broadly purple; the apical margin of the third tinged with purple; wings subfuscous, with their base hyaline. The head and thorax coarsely and closely punctured, the abdomen finely so; the tarsi with the claws unidentate.

Hab. Celebes.

Genus CHRYSIS, *Linn.*

1. *CHRYSIS PURPUREA*. *C. læte purpurea*, capite, thorace abdominisque basi rugosis punctatis, segmentis abdominis secundo et tertio delicatule punctatis, apice quadridentato.

Length 3 lines. Bright purple; the head, thorax, and base of the abdomen strongly and coarsely punctured, the rest of the abdomen finely punctured; the disk of the thorax and apical margins of the segments of the abdomen reflecting bright tints of green; the wings subhyaline, the nervures dark fuscous; the apical margin of the third segment of the abdomen with four teeth, the two central ones approximating, separated by a deep notch, the lateral teeth more distant, separated from the others by a wide emargination.

Hab. Celebes.

2. *CHRYSIS INSULARIS*. *C. nigro-purpurea, violaceo et viridi lavata*; capite, thorace abdominisque basi rude punctatis.

Length 5 lines. Dark purple, with violet and green reflections; the face, legs, and thorax beneath, green; wings slightly fuscous, and

iridescent; the head and thorax closely and coarsely punctured; the base of the abdomen roughly punctured, the two following segments much more finely so; the apical segment armed with six teeth, the outer ones subacute.

Hab. Celebes.

3. *CHYSIS SUMPTUOSA*. *C. fortiter punctata*, metallico-viridis auro lavata; thoracis disco, abdominis segmentis secundo et tertio basi purpureis; segmento apicali margine integro.

Length $3\frac{1}{2}$ lines. Golden-green; the thorax at the sides and posteriorly with bright coppery effulgence; an oblong purple spot on the disk of the thorax; the metathorax and its lateral teeth vivid green, the vertex and prothorax splashed with gold. Abdomen: the basal segment bright green, with a bright coppery or golden effulgence at the sides; the second segment purple at the base, coppery at the apex, and with a suffusion of green between these tints; the third segment is similarly coloured, with the apical margin entire; the insect closely and strongly punctured throughout.

Hab. Celebes.

Description of a new Genus of Crustacea, of the Family Pinnotheridæ; in which the fifth pair of legs are reduced to an almost imperceptible rudiment. By THOMAS BELL, Esq., Pres. L. S.

[Read June 3rd, 1858.]

Fam. PINNOTHERIDÆ, *Edwards*.

Genus AMORPHOPUS, *Bell*.

CHAR. GEN.:—Corpus subcylindricum. Testa semicircularis, margine posteriore recto.—*Antennæ externæ minimæ*, articulo basali orbitam subtus partim claudente.—*Antennularum fossulæ* transversæ, continuæ, et ab orbitis haud separatæ.—*Pedipalpi externi* articulo quarto ovato, palpo tri-articulato, ad angulum antico-interiorem articuli quarti inserto.—*Oris apertura* antice arcuata.—*Orbitæ* apertæ, margine inferiore carente, superiore integro.—*Oculi* transversim positi.—*Pedes antici* robusti, inæquales; *pedum paria secundum, tertium et quartum* longa, subcompressa; *par quintum* exiguum, simplicissimum, rudimentarium, in incisura articuli basalis paris quarti insertum.—*Abdomen* MARIS segmentis tertio cum quarto, et quinto cum sexto coalitis; FÆMINÆ ?

Sp. unica. *Amorphopus cylindraceus*, mihi.

Description.—The body is nearly cylindrical, somewhat depressed, the carapace very much curved from the point to the back, quite

straight from side to side; the anterior and lateral margins forming nearly a semicircle, the posterior margin straight; the orbits are deeply cut in the anterior margin of the carapace, looking upwards; the inferior margin wanting; the oral aperture much arched anteriorly; the external footjaws with the third articulation somewhat rhomboid, the fourth irregularly oval, and the palpi three-jointed, inserted at its anterior and inner angle. Epistome extremely small, transversely linear; the external antennæ placed directly beneath the orbits, the basal joints partly filling them beneath. The antennules folded transversely in large open fossæ, which are scarcely at all separated from each other, and are open to the orbits, the eyes lying transversely; the peduncles short and thick; the sternum is semicircular, the segments separated by very deep grooves; the abdomen very long and narrow, the first and second joint transversely linear, the third and fourth united and forming a triangle truncated anteriorly at the articulation of the portion formed by the fifth and sixth joints united, and which with the seventh form a very narrow and linear piece extending forwards to the posterior margin of the oral aperture; the first pair of legs robust, unequal (the right being the larger in the only specimen at present observed); the hand in each as broad as it is long; that of the smaller conspicuously tuberculated, that of the larger much less so; the former with the fingers nearly meeting throughout their length, those of the latter only at the tips; the second, third, and fourth pairs of legs are long, somewhat compressed, the third joint tuberculated on the under side, the third pair the longest; the fifth pair is reduced to a mere rudiment, in the form of a minute tubercle inserted in a little notch at the base of the first joint of the fourth pair, and scarcely discernible by the naked eye.

Observations.—The relation of this genus to the Pinnotheridæ is tolerably obvious, in the smallness of the antennæ, the direction and arrangement of the eyes, and particularly in the form of the oral aperture, and of the external footjaws. I shall not, however, enter upon the consideration of these relations, as I am about shortly to offer to the Society a review and monograph of the whole of this family. The most remarkable peculiarity in the genus is the apparent absence of the fifth pair of legs, which can only be discovered to exist at all by examination with the help of a lens. In this respect I doubt not that the Fabrician genus *Hexapus*, adopted and figured by De Haan, will be found to agree with it, although it is very remarkable that the anomalous condi-

tion of this part never excited any particular attention on the part of either of these distinguished naturalists; and De Haan describes Fabricius's species, *Hexapus sexpes*, as if there were nothing especial or abnormal in a Decapod having only six pairs of legs besides the claws. Mr. White made a similar mistake on one occasion, when he described an anomourous genus allied to *Lithodes*, in which the fifth pair of legs were not visible; but when, at my suggestion, a more careful examination was made, they were found, as was anticipated, in a rudimentary form, concealed under the edge of the carapace. I believe that I can discover even in De Haan's figure something like a little tubercle at the base of the fourth leg, which is probably the rudimentary representative of the fifth.

Death of the Common Hive Bee, supposed to be occasioned by a parasitic Fungus. By the Rev. HENRY HIGGINS. Communicated by the President.

[Read June 3rd, 1858.]

ON the 18th of March last, Timpron Martin, Esq., of Liverpool, communicated to me some circumstances respecting the death of a hive of bees in his possession, which induced me to request from him a full statement of particulars. Mr. Martin gave me the following account:—

“In October last I had three hives of bees which I received into my house. Each doorway was closed, and the hive placed upon a piece of calico; the corners were brought over the top, leaving a loop by which the hive was suspended from the ceiling. The hives were taken down about the 14th of March; two were healthy, but all the bees in the third were dead. There was a gallon of bees. The two hives containing live bees were much smaller; but in each of them were dead ones. Under whatever circumstances you preserve bees through the winter, dead ones are found at the bottom, in the spring. The room, an attic, was dry; and I had preserved the same hives in the same way during the winter of 1856. In what I may call the dead hive there was abundance of honey when it was opened; and it is clear that its inmates did not die for want. It is not a frequent occurrence for bees so to die; but I have known another instance. In that case the hive was left out in the ordinary way, and possibly cold was the cause of death. I think it probable that my bees died about a month before the 14th of

March, merely from the circumstance that some one remarked about that time that there was no noise in the hive. They might have died earlier; but there were certainly live bees in the hive in January. I understand there was an appearance of mould on some of the combs. There was ample ventilation, I think; indeed, as the bees were suspended, they had more air than through the summer when placed on a stand."

When the occurrence was first made known to me, I suggested that the bees might probably have died from the growth of a fungus, and requested some of the dead bees might be sent for examination. They were transmitted to me in a very dry state; and a careful inspection with a lens afforded no indications of vegetable growth. I then broke up a specimen, and examined the portions under a compound microscope, using a Nachet No. 4. The head and thorax were clean; but on a portion of the sternum were innumerable very minute, linear, slightly curved bodies, showing the well-known oscillatory or swarming motion. Notwithstanding the agreement of these minute bodies with the characters of the genus of *Bacterium* of the Vibrionia, I regarded them as spermatia, having frequently seen others undistinguishable from them under circumstances inconsistent with the presence of *Conferæ*, as in the interior of the immature peridia and sporangia of Fungals.

In the specimen first examined there were no other indications of the growth of any parasite; but from the interior of the abdomen of a second bee I obtained an abundance of well-defined globular bodies resembling the spores of a fungus, varying in size from .00016 to .00012 in. Three out of four specimens subsequently examined contained similar spores within the abdomen. No traces of a mycelium were visible; the plants had come to maturity, fruited, and withered away, leaving only the spores.

The chief question then remaining to be solved was as to the time when the spores were developed; whether before or after the death of the bees. In order, if possible, to determine this, I placed four of the dead bees in circumstances favourable for the germination of the spores, and in about ten days I submitted them again to examination. They were covered with mould, consisting chiefly of a species of *Mucor*, and one also of *Botrytis* or *Botryosporium*. These fungi were clearly extraneous, covering indifferently all parts of the insects, and spreading on the wood on which they were lying. On the abdomen of all the specimens, and on the clypeus of one of them, grew a fungus wholly unlike the sur-

rounding mould. It was white and very short, and apparently consisted entirely of spores arranged in a moniliform manner, like the fertile filaments of a stemless *Penicillium*. These spores resembled those found in the abdomen of the Bees, and proceeded I think, from them. The filaments were most numerous at the junction of the segments. The spores did not resemble the globules in *Sporendonema muscæ* of the English Flora, neither were they apparently enclosed.

The Rev. M. J. Berkeley, to whom I sent some of the bees, procured, by scraping the interior of the abdomen with a lancet, very minute, curved linear bodies from $\frac{1}{8000}$ to $\frac{1}{10000}$ in. long, which he compares to Vibrios. He also found mixed with them globular bodies, but no visible stratum of mould.

From the peculiar position of the supposed spores within the abdomen of the bees, and from the subsequent growth of a fungus unlike any of our common forms of Mucedines, I think it probable that the death of the bees was occasioned by the presence of a parasitic fungus.

Notice of the occurrence of recent Worm Tracks in the Upper Part of the London Clay Formation near Highgate. By JOHN W. WETHERELL. Communicated by JAMES YATES, Esq., M.A., F.L.S.

[Read June 3rd, 1858.]

THE London clay is very tenacious, and near the surface is generally of a brown colour, probably owing to the decomposition of the iron pyrites which it contains. It abounds in selenite or sulphate of lime, and in nodules which often contain organic remains. Fossil wood with *Teredo antenautæ* is also met with, and pyritous casts of univalve and bivalve shells. Lower down the stratum becomes more compact and is of a bluish or blackish colour, and its fossil contents are in a fine state of preservation. During the last summer, while examining the London Clay in the vicinity of Highgate in search of fossils, my attention was directed to certain appearances in it which I could not account for. This led to a further examination, when I found they were produced by the borings of *Lumbrici* or earth-worms. These appearances consisted of long tubes passing nearly perpendicularly through the clay and terminating in receptacles or *nidi*, each tube leading to a separate receptacle. As these receptacles

occurred in large numbers, I had an opportunity of examining a great many of them with various results. In one instance, I found a dead worm coiled up; in another, a portion of a worm protruding into the lower part of the tube. Again, *nidi* were found partially filled with only the casts of worms, whilst others contained more or less of a species of *Conferva*; and, lastly, I obtained some with the cavities partially or wholly filled up. The receptacles varied in shape, from a sphere to an oval, and were extremely thin and fragile. They also varied in size from a pea to a nut. Externally they presented an appearance so singularly contorted, that I could not help considering they were moulded from the casts of worms. They did not appear to have any attachment to the surrounding clay, except at the point of junction with the tube; and the clay beneath them presented no unusual appearance.

Internally they generally exhibited impressions of the worm; but occasionally I detected some of the round and contorted appearances which I have mentioned as being so conspicuous on the outside. I cannot speak with precision as to the length of the tubes, as the clay when examined had been broken up into large rough masses in digging for the foundations of houses. The largest noticed was about three inches long, and the general width one-eighth of an inch. They often run parallel to each other, but at unequal distances. I now have to notice what I consider a remarkable circumstance, namely, that all the tubes contained a solid cylinder of clay, and in every instance where the worms occurred under the circumstances above recorded, they were found to be dead. Researches of this kind are calculated to throw a light on some of those singular phenomena which geologists occasionally meet with in the older rocks.

[*Mem.*—Several specimens of clay, containing the worm-tubes as above described, were exhibited to the meeting.]

Natural History—Extracts from the Journal of Captain Denham, H.M. Surveying Vessel 'Herald,' 1857. Communicated by Captain WASHINGTON, through the Secretary.

[Read June 3rd, 1858.]

WE found upon the larger islands the small species of the Kangaroo, bearing the native name Wallaby (*Halmaturus Billar-*

dierii), which, when mixed with other meats, affords a fine-flavoured soup.

On the islets are flocks of the Cape Banca goose, which Mr. Smith informed me were only to be found in these straits in the vicinity of Flinders Island, from Cape Banca to Cape Frankland (west about), and that they are readily domesticated, and hatch from three to seven eggs, and afford an acceptable dish. I obtained a live specimen, which Dr. Rayner of this ship describes thus:—“*Cercopsis Novæ Hollandiæ*. Body about the size of a common goose; bill short, vaulted, obtuse, two-thirds of which is covered by an expanded cere of a pale greenish-yellow colour, the tip of the bill being black, arcuated, and truncated. Nostrils large, round, open, and situated in the middle of the bill. Wings ample, third quill longest. Legs long, light dull-red, and naked to a little above the knee. Feet black, webbed, the membrane being deeply notched, great toe articulated to the metatarsus. Plumage slate-grey, with black spots upon the wings and back. Wing-feathers dusky black, and edged at the tip with pale grey. Irides light hazel.”

We likewise obtained specimens of the following wildfowl:—

AVES.

| | |
|-----------------------|---|
| A BRONZE-WING PIGEON, | Phaps elegans. |
| QUAIL, | Coturnix pectoralis (<i>Gould</i>). |
| OYSTER-CATCHER, | Hæmatophus fuliginosus. |
| RING PLOVER, | Hiaticula bicincta. |
| WILD DUCK, | Anas punctata (<i>Cuvier</i>). |
| GREAT GULL, | Larus pacificus. |
| LESSER GULL, | Xema Jamesonii. |
| MUTTON BIRD, | Puffinus brevicaudus (<i>Brandt</i>). |
| SOUTHERN GANNET, | Sulu australis (<i>Gould</i>). |
| SMALL PENGUIN, | Spheniscus minor (<i>Temminck</i>). |

The Mutton Bird we observed streaming from island to island; and I learnt from Mr. Benvenuto Smith the following particulars of its habits from his own observations.

The male birds come in from sea in the month of September, and prepare the burrows for the reception of the hens. The hen bird does not make her appearance till about the 25th November, when she lays and sits at once.

The Mutton Bird lays but one egg; they are employed rearing the young bird until the month of May, at which time the old birds leave the young ones to shift for themselves; the young birds remain in the burrows till they are starved down, and then

set off to sea, and are not seen again amongst the islands till September. The cock and hen sit alternately night and day; and all the labour of providing for the young is equally shared.

There are at this date about ninety people living on the small islands in "Franklin Inlet" who make a livelihood by gathering the oil, feathers, and eggs of the Mutton Bird.

Upwards of 2000 gallons of the oil are extracted from the birds annually; and although 300,000 birds are known to be destroyed each year, they appear undiminished in numbers. The oil burns well, and is of a bright-red colour.

I was presented by Mr. Smith with two Paper Nautilus shells (*Argonauta tuberculosa*) found on the shore of Flinders Island this season, a circumstance which he has remarked occurs but every seventh year, when many hundreds are thrown up: the shells are rarely obtained perfect, as they are extremely fragile, and the sea fowl pick the fish out of them.

Our Botanic Collector, Mr. Milne, ascertained, from what he obtained himself and from what we could contribute from our individual visits to the islets, the existence of plants, which he believes to be indigenous, belonging to the following families and genera, viz.

| | |
|---------------|--------------|
| Amentaceæ. | Umbelliferæ. |
| Asteraceæ. | Graminaceæ. |
| Rosaceæ. | Juncæ. |
| Geraniaceæ. | Solanum. |
| Euphorbiaceæ. | Geranium. |
| Myrtaceæ. | |

Testing the chances of fish refreshment at this anchorage, we found little encouragement for hook and line; but the two favouring opportunities which the weather allowed for hawling the seine produced as tabulated on opposite page.

We found the Reef Islands in this sound so abundant in rabbits since Captain Stokes's forethought had set some loose upon them, that, in two visits of four hours with but four guns, 100 brace were brought on board.

I took care to follow my esteemed brother officers' example and the system of introducing such productions, and obtained a dozen couple alive for letting loose in Shark Bay.

[A coloured drawing of *Cereopsis Novæ Hollandiæ* accompanied Captain Denham's observations.]

| Locality. | How many haws and phase of O. | Trawl-seine, or hook and line. | | Natural History Names. | Common Names. | No. of sorts. | Pounds weight. |
|------------------------|-------------------------------------|--------------------------------|----------------------|------------------------|-----------------------------------|------------------|-------------------|
| | | Depth of water. | Nature of bottom. | | | | |
| West side | 6 haws | with seine. | ... | Mugil | Mullet | 23 | 28 |
| Flinders Isl. ... | ... | $\frac{1}{2}$ | ... | Hemiramphus | Gar-fish..... | 10 | 5 |
| Settlement ... | O | 1 fathom | Sand | Platycephalus | Flat-head, small | 3 | 1 |
| Bay | 14 days | on | and | Raia | Sting Ray..... | 2 | 29 |
| H.W.F. & C.D X. 30. | ... | a flat | weed | Iulis | Small fish of the Basse family... | Several | ... |
| Range 10 ft. ... | L.W. | ... | ... | Labrax | Basse | 1 | 1 |
| East side of | 7 haws | with seine (mar.). | ... | Myliobatis | Ray | 11 | 375 |
| Hummock ... |) | ... | ... | Mugil..... | Mullet | 20 | 30 |
| Island centre... | 26 days | 1 to 3 fms. | Sandy beach | Platycephalus | Flat-head | 3 | 2 |
| | | | | Siphyracua..... | Barracouta | 1 | 1 |
| | | | | Scomberesox | Saury | 27 | 17 |
| Bay | at $\frac{3}{4}$ flood | ... | ... | Sepioteuthis | Cuttle-fish..... | Several | ... |
| | | | | | Total | ... | 489 |

On some points in the Anatomy of *Nautilus pompilius*. By T. H. HUXLEY, F.R.S., Professor of Natural History, Government School of Mines.

[Read June 3rd, 1858.]

SOME time ago my friend Dr. Sinclair, of New Zealand, had the kindness to offer me two specimens of the Pearly Nautilus which had been brought to him from New Caledonia, preserved in Goadby's solution. I gladly accepted the present, and looked forward to the dissection of the rare animal with no little pleasure; but on proceeding to examine one of the specimens, I found its anatomical value greatly diminished by the manner in which a deposit from the solution had glued together some of the internal viscera. Other parts of the Nautilus, however, were in a very good state of preservation; and I have noted down such novel and interesting peculiarities as they presented, in the hope that an account of them will be acceptable to the Linnean Society.

Of the six apertures which, besides the genital and anal outlets, open into the branchial cavity of *Nautilus pompilius*, one on each side lies immediately above and in front of that fold of the inner wall of the mantle which forms the lower root of the smaller and inner gill, and encloses the branchial vein of that gill. The aperture is elongated and narrow, with rather prominent lips. It measures about $\frac{1}{8}$ th of an inch.

The other two apertures are larger, and lie at a distance of $\frac{7}{16}$ ths of an inch below and behind the other. They are in close juxtaposition, being separated only by a thin triangular fold of membrane, which constitutes the inner lip of the one and the outer lip of the other.

The inner aperture is the larger, measuring $\frac{3}{16}$ ths of an inch in long diameter, and having the form of a triangle with its base directed posteriorly. The outer aperture is not more than $\frac{1}{8}$ th of an inch long. The two apertures lie just above the edge of the fold of membrane which runs from the inner root of the larger or outer branchia, across the branchial cavity and beneath the rectum, to the other side.

These apertures lead into five sacs, which collectively constitute what has been described as the pericardium. The sacs into which the superior apertures open, by a short wide canal with folded walls, are situated on each side of and above the rectum. Their inner boundaries are separated by a space of not less than $\frac{5}{8}$ ths of an

inch in width, in which lie the vena cava and the oviduct. Each cavity has a rounded circumference, and a transverse diameter of about half an inch. In a direction at right angles to this diameter the dimensions vary with its state of distension; but a quarter of an inch would be a fair average.

The anterior or outer wall of the cavity is formed by the mantle; the posterior, inner, or visceral wall by a delicate membrane. The former separates it from the branchial cavity; the latter from the fifth sac, to be described by-and-by. I could find no natural aperture in the thin inner wall, so that I conceive no communication can take place between either of these sacs and the fifth sac.

Two irregular, flattened, brownish, soft plates depend from the posterior wall of the sac into its cavity; their attached edges are fixed along a line which is directed from behind obliquely forwards and upwards.

The outer and smaller of the inferior apertures on each side leads into a sac of similar dimensions and constitution to the preceding, but having a less rounded outline in consequence of its being flattened in one direction against its fellow of the opposite side, from which it is separated only by a delicate membranous wall, whilst on another side it is applied against the inferior wall of the superior sac, and is in like manner separated from it only by a thin and membranous partition.

Like the upper sacs, each of these has two dark-brown, lamellar, glandular masses depending from its membranous visceral wall.

A delicate, but broad, triangular membranous process, about $\frac{1}{4}$ th of an inch long, hangs down freely from the visceral wall of the cavity just behind the opening of the short canal which connects the sac with its aperture.

The third and largest aperture on each side opens directly into a very large fifth cavity, whose boundary is formed anteriorly by the visceral walls of the sacs already described, and behind this by the mantle itself as far as the horny band which marks and connects the insertion of the shell-muscles.

In fact this cavity may be said to be co-extensive with the attached part of the mantle,—the viscera, enclosed within their delicate “peritoneal” membranous coat, projecting into and nearly filling it, but nevertheless leaving a clear space between themselves and the delicate posterior wall of the mantle.

A layer of the “peritoneal” membrane extends from the posterior edge of the muscular expansion which lies between the shell-muscles and from the upper wall of the dilatation of the vena cava,

and passes upwards and backwards like a diaphragm to the under surfaces of the gizzard and liver. It is traversed by the aorta, to whose coats it closely adheres.

Along a line nearly corresponding with the horny band which proceeds from the insertions of the shell-muscles and encircles the mantle below, the pallial wall is produced inwards and forwards into a membranous fold or ligament, which I will call the pallio-visceral ligament; and this pallio-visceral ligament becoming attached to various viscera, divides the great fifth chamber into an anterior inferior, and a posterior superior portion, which communicate freely with one another.

Commencing with its extreme right-hand end, the ligament is inserted into the line of reflection of the mantle, and then into the wall of the oviduct, which becomes enclosed as it were within the ligament. The latter then ends in a free edge on the inner side of the oviduct, and is continued along it until it reaches the inferior surface of the apex of the ovary, into which it is inserted.

The free edge is arcuated; and the rectum passes over it, but is in no way connected with it.

Here, therefore, is one great passage of communication between the anterior and posterior divisions of the fifth chamber.

On the left side, this aperture is limited by the heart, whose posterior edge is, on the left side, connected by means of a ligamentous band with the surface of the apex of the ovary; but on the right, for the greater part of its extent, receives a process of the pallio-visceral ligament. Between the ovario-cardiac ligament and this process lies the small oval aperture already described by Professor Owen, which gives passage to the siphonal artery. It constitutes the middle aperture of communication between the two divisions of the fifth chamber.

The left-hand end of the ligament is inserted into the upper wall of the dilated end of the vena cava; but between this point and the heart it has a free arcuated edge, as on the right side.

Thus there are in reality three apertures of communication between the two divisions of the fifth chamber, the middle, by far the smallest, being alone hitherto known.

A delicate membranous band passes from the whole length of the middle line of the rectum to the heart and to the ovary.

The singular "pyriform appendage" of the heart lies in the left process of the ligament, its anterior edge nearly following the arcuated contour of that process.

The siphuncular process of the mantle was broken in my speci-

men; but its aperture appeared to communicate quite freely with the posterior division of the fifth chamber.

Four sets of brownish, glandular-looking bodies depend into the anterior division of the fifth chamber, from parts of the delicate septa dividing this from the four small sacs, corresponding with the insertions of the glandular bodies above described.

In fact, on distending the vena cava with air, it is found that the four branchial arteries traverse these septa, and that the appendages in question are diverticula of their walls. Consequently the anterior wall of each branchial vein is produced into two glandular appendages, which hang into one of the four smaller sacs, while the posterior wall is produced into a single mass of appendages, which hangs into the anterior division of the fifth chamber.

Although, as I believe, the five chambers do not communicate directly, all the appendages must nevertheless be equally bathed with sea-water, which enters by the apertures of the chambers.

An impacted yellowish-white concretionary matter filled the anterior chamber; and a small quantity of it lay as a fine powder at the bottom of the posterior one. In the latter, however, its presence might, by possibility, have been accidental. My colleague, Dr. Percy, who kindly undertook to examine this substance, informs me that he has been unable to detect uric acid in it. The follicular appendages of the branchial arteries present remarkable differences in their external appearance. The eight which hang into the four anterior chambers are similar, slightly festooned, but otherwise simple lamellæ; while the four which depend into the posterior chambers are produced into a number of papillary processes. This external difference is obvious enough: whether it be accompanied by a corresponding discrepancy in minute structure I am unable to say; for I have not as yet been able to arrive at any satisfactory results from the microscopic examination of the altered tissues, and, as will be seen below, the only observer who has had the opportunity of examining the Nautilus in the fresh state has not noted any difference of structure in the two sets of follicles.

One is naturally led to seek among other mollusks for a structure analogous to the vast posterior aquiferous chamber of the Nautilus; and it appears to me that something quite similar is offered by the *Ascidiodida* and the *Brachiopoda*. In both cases, the viscera, inclosed within a delicate tissue, project into a large cavity communicating freely with the exterior by the cloacal aper-

ture in the one case, and by the funnel-shaped channels which have been miscalled "hearts" in the other.

The rudimentary renal organs of the Ascidian are developed in the walls of the cavity in question; and an aquiferous chamber of smaller dimensions has the same relation to the kidney in Lamellibranchiata—in Gasteropoda, Heteropoda, Pteropoda, and dibranchiate Cephalopoda. But although such is likely enough to be the case, we do not know at present that the aquiferous chambers in any of the last named mollusks attain an extension similar to that which obtains in *Nautilus*.

On comparing the observations detailed above with the statements of previous writers, I find that, in his well-known "Memoir on the Pearly *Nautilus*" (1832), Professor Owen describes "on each side, at the roots of the branchiæ," "a small mamillary eminence with a transverse slit which conducts from the branchial cavity into the pericardium. There is, moreover, a foramen at the lower part of the cavity (*o*, pl. 5) permitting the escape of a small vessel; and by the side of this vessel a free passage is continued between the gizzard and ovary into the membranous tube or siphon that traverses the divisions of the shell, thus establishing a communication between the interior of that tube and the exterior of the animal."

The foramen here described is easily seen; but, as I have stated, there are other modes of communication between the so-called pericardium and the cavity with which the siphuncle communicates, of a far more extensive nature.

With respect to the pericardium itself, Professor Owen states, "The peritoneum, after lining the cavity which contains the crop and liver, and enveloping those viscera, forms two distinct pouches at the bottom of the pallial sac, in one of which, the left, is contained the gizzard, and in the other the ovary; anterior to these, and on the ventral aspect of the liver, is another distinct cavity, of a square shape, which contains the heart and principal vessels, with the glandular appendages connected therewith." This is what the author terms the pericardium.

As Van der Hoeven has pointed out, however, the gizzard lies to the right and the ovary to the left. Moreover, the gizzard is superior to the ovary, so as only to overlap it a little above; and I can find no evidence of the existence of such distinct pouches as those described.

Professor Owen states that the branchiæ "arise by a common peduncle from the inner surface of the mantle." My own obser-

vations, however, and Van der Hoeven's figures, of both male and female, lead me to believe that the peduncles of the branchiæ are perfectly distinct from one another.

The follicles of the branchial arteries are thus described in the "Memoir on the Pearly Nautilus:"—"They are short and pyri-form and closely set together. To each of the branchial arteries are appended three clusters of these glands, of which one is larger than the united volume of both the others; and the larger cluster is situated on one side of the vessel and the two smaller on the opposite side. Each of these clusters is contained in a membranous receptacle proper to itself, partitioned off, as it were, from the pericardium, but communicating with it. . . . The two canals which form the communication between the pericardium and the branchial cavity commence at the receptacle of the lesser cluster attached to the superior branchial arteries, and terminate at the papillæ before mentioned, which are situated at the roots of the branchiæ. The pericardium and these receptacles of the glands, when first laid open, were found filled with a coagulated substance so closely compacted as to require a careful removal, bit by bit, before the contained follicles and vessels could be brought into view."

Like Valenciennes and Van der Hoeven, I have been unable to find any communication between the four sacs in which the small double clusters of follicles are contained, and the "pericardium;" and I hold it to be certain that the other four sets of follicles are not contained in sacs at all, but lie free in the "pericardium" or posterior chamber.

No notice is here taken of the widely different characters of the anterior and posterior follicles; and the figure gives both a similar structure.

Valenciennes ("Nouvelles Recherches sur le Nautille Flambé," 'Archives du Muséum,' ii., 1841) pointed out the existence of three pairs of apertures opening into the branchial sac, besides the genital and anal openings; and he affirms that they open into as many closed sacs, which communicate neither with one another nor with the cavity that contains the heart. M. Valenciennes indicates the difference in the structure of the anterior and posterior venous appendages. He seems to me to have seen something of the part which I have described as the pallio-visceral ligament; but I cannot clearly comprehend either his figure or his description.

Van der Hoeven, in his 'Contributions to the Knowledge of the Animal of *Nautilus pompilius*,' 1850, confirmed the statement

of Valenciennes with regard to the existence of three pairs of apertures; but he showed, in opposition to him, that one of these pairs of apertures communicated with the pericardium. The sacs into which the other two pairs open are, according to this anatomist, blind. In the aperture of the anterior blind sac he found a concretionary matter which he supposed to contain uric acid, but chemical analysis did not confirm the supposition. Van der Hoeven refers to some observations by Vrolik; but as these are in Dutch, and have not, so far as I can find, been translated into either French, German, or English, I know not what they may contain.

In his more recent essay, translated in 'Wiegmann's Archiv' for 1857, under the title of "Beitrag zur Anatomie von *Nautilus pompilius*," Van der Hoeven states that he has again found hard concretions in the chamber enclosing the appendage of the anterior branchial artery, and that these on chemical analysis yielded phosphate of lime and traces of fat and albumen, but no uric acid.

Mr. Macdonald, in a valuable paper on the anatomy of *Nautilus umbilicatus*, published in the Philosophical Transactions for 1855, thus describes the follicular appendages of the branchial arteries:—

"These follicles are subcylindrical in form, somewhat dilated at the free extremity, to which is appended a folded and funnel-shaped process of membrane, which expands rather suddenly, presenting a jagged and irregular border. They open by a smooth and oval or slit-like, orifice into the afferent pulmonary vessels, on each of which, as Professor Owen has observed, they are disposed in three clusters. The outer membrane is smooth and glassy, homogeneous in structure and sprinkled over with minute rounded and transparent bodies, probably the nuclei of cells. Beneath this layer, flat bundles of fibres, apparently muscular, are traceable here and there, principally disposed in a longitudinal direction, and sometimes branched. The lining membrane consists of a loose epithelial pavement in many respects similar to that of the uriniferous tubules of the higher animals, the cells containing, besides the nuclei, numerous minute oil-globules, or a substance much resembling concrete fatty matter. This membrane is thrown up into an infinite number of papillæ and corrugations, so as to augment the extent of surface considerably. The papillæ are more numerous at the inner part or towards the attached end; and a circle of longitudinally disposed folds radiate from the bottom of the follicles, in which a number of small pits or fenestrations are sometimes visible. The sides of these folds are wrinkled

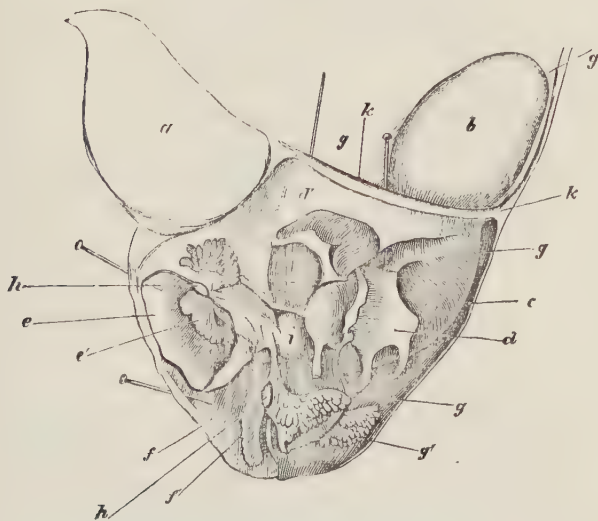
transversely so as to present a median zigzag elevation. The funnel-shaped membranous process above noticed is continuous with the lining membrane, consisting of an extension of the same epithelial pavement; but the cells are somewhat larger and more regular in form. The cavity of each follicle, therefore, communicates with the exterior through the centre of this process; and the aperture is thus guarded by a kind of circular valve, permitting the escape of secreted matter, but effectually preventing the entrance of fluid from without."

In his fig. 9, pl. xv., Mr. Macdonald depicts certain "crystalline bodies often occurring within the follicles."

From what Mr. Macdonald states, one would be led to conclude that all the follicles have the same structure; but I suspect this to be an oversight.

In the second edition of Professor Owen's *Lectures on the Invertebrata* (1855), I find no mention of Valenciennes' discovery

Nautilus pompilius. Fig. 1.



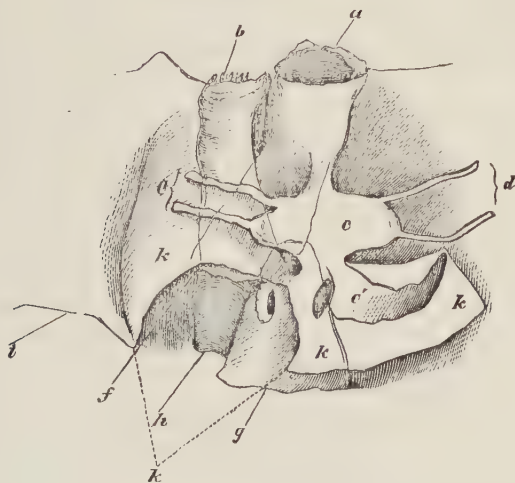
Viewed from the left side and a little behind.

Two of the anterior chambers, and the fifth or posterior chamber, laid open.
Natural size.

- a.* Shell muscle. *b.* Ovary. *c.* Intestine. *d.* Heart; *d'* its pyriform appendage. *e.* Superior anterior chamber; *e'* its follicles. *f.* Inferior anterior chamber; *f'* its follicles. *g.* Posterior chamber; *g'* Follicles. *h.* Cut ends of branchial arteries. *i.* Termination of vena cava. *k.* Pallio-visceral ligament.

of the additional four apertures; but the author states that "on each side, at the roots of the anterior branchiæ, there is a small mamillary eminence with a transverse slit, which conducts from the branchial cavity to one of the compartments of the pericardium containing two clusters of venous glands. There are also two similar, but smaller, slits, contiguous to one another, near the root of the posterior branchia on each side, which lead to and may admit sea-water into the compartments containing the posterior cluster of the venous follicles." In this work the ovary is not only described, but *figured*, on the right side of the gizzard. The figure, however, rightly places the greater part of the ovary below that organ.

Nautilus pompilius. Fig. 2.



Natural Size.

The pallio-visceral ligament seen from below: torn on the right side to show the rectum and oviduct; cut through on the left side along the dotted line close to *d'* in the preceding figure.

a. Anus. *b.* Oviducal aperture. *c.* Heart. *d.* Left branchial veins. *e.* Right branchial veins. *f.* Oviduct cut through. *g.* Ovary. *h.* Rectum. *i.* Mantle. *k k k.* Pallio-visceral ligament; *k'* its torn portion. The oval "aperture for the siphonal artery" is seen to the left of *c'*, and the right-hand style in *Fig. 1* passes through it.

On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection. By CHARLES DARWIN, Esq., F.R.S., F.L.S., & F.G.S., and ALFRED WALLACE, Esq. Communicated by Sir CHARLES LYELL, F.R.S., F.L.S., and J. D. HOOKER, Esq., M.D., V.P.R.S., F.L.S., &c.

[Read July 1st, 1858.]

London, June 30th, 1858.

MY DEAR SIR,—The accompanying papers, which we have the honour of communicating to the Linnean Society, and which all relate to the same subject, viz. the Laws which affect the Production of Varieties, Races, and Species, contain the results of the investigations of two indefatigable naturalists, Mr. Charles Darwin and Mr. Alfred Wallace.

These gentlemen having, independently and unknown to one another, conceived the same very ingenious theory to account for the appearance and perpetuation of varieties and of specific forms on our planet, may both fairly claim the merit of being original thinkers in this important line of inquiry; but neither of them having published his views, though Mr. Darwin has for many years past been repeatedly urged by us to do so, and both authors having now unreservedly placed their papers in our hands, we think it would best promote the interests of science that a selection from them should be laid before the Linnean Society.

Taken in the order of their dates, they consist of:—

1. Extracts from a MS. work on Species*, by Mr. Darwin, which was sketched in 1839, and copied in 1844, when the copy was read by Dr. Hooker, and its contents afterwards communicated to Sir Charles Lyell. The first Part is devoted to "The Variation of Organic Beings under Domestication and in their Natural State;" and the second chapter of that Part, from which we propose to read to the Society the extracts referred to, is headed, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."

2. An abstract of a private letter addressed to Professor Asa Gray, of Boston, U.S., in October 1857, by Mr. Darwin, in which

* This MS. work was never intended for publication, and therefore was not written with care.—C. D. 1858.

he repeats his views, and which shows that these remained unaltered from 1839 to 1857.

3. An Essay by Mr. Wallace, entitled "On the Tendency of Varieties to depart indefinitely from the Original Type." This was written at Ternate in February 1858, for the perusal of his friend and correspondent Mr. Darwin, and sent to him with the expressed wish that it should be forwarded to Sir Charles Lyell, if Mr. Darwin thought it sufficiently novel and interesting. So highly did Mr. Darwin appreciate the value of the views therein set forth, that he proposed, in a letter to Sir Charles Lyell, to obtain Mr. Wallace's consent to allow the Essay to be published as soon as possible. Of this step we highly approved, provided Mr. Darwin did not withhold from the public, as he was strongly inclined to do (in favour of Mr. Wallace), the memoir which he had himself written on the same subject, and which, as before stated, one of us had perused in 1844, and the contents of which we had both of us been privy to for many years. On representing this to Mr. Darwin, he gave us permission to make what use we thought proper of his memoir, &c.; and in adopting our present course, of presenting it to the Linnean Society, we have explained to him that we are not solely considering the relative claims to priority of himself and his friend, but the interests of science generally; for we feel it to be desirable that views founded on a wide deduction from facts, and matured by years of reflection, should constitute at once a goal from which others may start, and that, while the scientific world is waiting for the appearance of Mr. Darwin's complete work, some of the leading results of his labours, as well as those of his able correspondent, should together be laid before the public.

We have the honour to be yours very obediently,

CHARLES LYELL.

JOS. D. HOOKER.

J. J. Bennett, Esq.,

Secretary of the Linnean Society.

- I. *Extract from an unpublished Work on Species, by C. DARWIN, Esq., consisting of a portion of a Chapter entitled, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."*

De Candolle, in an eloquent passage, has declared that all nature is at war, one organism with another, or with external nature.

Seeing the contented face of nature, this may at first well be doubted; but reflection will inevitably prove it to be true. The war, however, is not constant, but recurrent in a slight degree at short periods, and more severely at occasional more distant periods; and hence its effects are easily overlooked. It is the doctrine of Malthus applied in most cases with tenfold force. As in every climate there are seasons, for each of its inhabitants, of greater and less abundance, so all annually breed; and the moral restraint which in some small degree checks the increase of mankind is entirely lost. Even slow-breeding mankind has doubled in twenty-five years; and if he could increase his food with greater ease, he would double in less time. But for animals without artificial means, the amount of food for each species must, *on an average*, be constant, whereas the increase of all organisms tends to be geometrical, and in a vast majority of cases at an enormous ratio. Suppose in a certain spot there are eight pairs of birds, and that *only* four pairs of them annually (including double hatches) rear only four young, and that these go on rearing their young at the same rate, then at the end of seven years (a short life, excluding violent deaths, for any bird) there will be 2048 birds, instead of the original sixteen. As this increase is quite impossible, we must conclude either that birds do not rear nearly half their young, or that the average life of a bird is, from accident, not nearly seven years. Both checks probably concur. The same kind of calculation applied to all plants and animals affords results more or less striking, but in very few instances more striking than in man.

Many practical illustrations of this rapid tendency to increase are on record, among which, during peculiar seasons, are the extraordinary numbers of certain animals; for instance, during the years 1826 to 1828, in La Plata, when from drought some millions of cattle perished, the whole country actually *swarmed* with mice. Now I think it cannot be doubted that during the breeding-season all the mice (with the exception of a few males or females in excess) ordinarily pair, and therefore that this astounding increase during three years must be attributed to a greater number than usual surviving the first year, and then breeding, and so on till the third year, when their numbers were brought down to their usual limits on the return of wet weather. Where man has introduced plants and animals into a new and favourable country, there are many accounts in how surprisingly few years the whole country has become stocked with them. This increase would

necessarily stop as soon as the country was fully stocked; and yet we have every reason to believe, from what is known of wild animals, that *all* would pair in the spring. In the majority of cases it is most difficult to imagine where the checks fall—though generally, no doubt, on the seeds, eggs, and young; but when we remember how impossible, even in mankind (so much better known than any other animal), it is to infer from repeated casual observations what the average duration of life is, or to discover the different percentage of deaths to births in different countries, we ought to feel no surprise at our being unable to discover where the check falls in any animal or plant. It should always be remembered, that in most cases the checks are recurrent yearly in a small, regular degree, and in an extreme degree during unusually cold, hot, dry, or wet years, according to the constitution of the being in question. Lighten any check in the least degree, and the geometrical powers of increase in every organism will almost instantly increase the average number of the favoured species. Nature may be compared to a surface on which rest ten thousand sharp wedges touching each other and driven inwards by incessant blows. Fully to realize these views much reflection is requisite. Malthus on man should be studied; and all such cases as those of the mice in La Plata, of the cattle and horses when first turned out in South America, of the birds by our calculation, &c., should be well considered. Reflect on the enormous multiplying power *inherent and annually in action* in all animals; reflect on the countless seeds scattered by a hundred ingenious contrivances, year after year, over the whole face of the land; and yet we have every reason to suppose that the average percentage of each of the inhabitants of a country usually remains constant. Finally, let it be borne in mind that this average number of individuals (the external conditions remaining the same) in each country is kept up by recurrent struggles against other species or against external nature (as on the borders of the Arctic regions, where the cold checks life), and that ordinarily each individual of every species holds its place, either by its own struggle and capacity of acquiring nourishment in some period of its life, from the egg upwards; or by the struggle of its parents (in short-lived organisms, when the main check occurs at longer intervals) with other individuals of the *same* or *different* species.

But let the external conditions of a country alter. If in a small degree, the relative proportions of the inhabitants will in most cases simply be slightly changed; but let the number of

inhabitants be small, as on an island, and free access to it from other countries be circumscribed, and let the change of conditions continue progressing (forming new stations), in such a case the original inhabitants must cease to be as perfectly adapted to the changed conditions as they were originally. It has been shown in a former part of this work, that such changes of external conditions would, from their acting on the reproductive system, probably cause the organization of those beings which were most affected to become, as under domestication, plastic. Now, can it be doubted, from the struggle each individual has to obtain subsistence, that any minute variation in structure, habits, or instincts, adapting that individual better to the new conditions, would tell upon its vigour and health? In the struggle it would have a better *chance* of surviving; and those of its offspring which inherited the variation, be it ever so slight, would also have a better *chance*. Yearly more are bred than can survive; the smallest grain in the balance, in the long run, must tell on which death shall fall, and which shall survive. Let this work of selection on the one hand, and death on the other, go on for a thousand generations, who will pretend to affirm that it would produce no effect, when we remember what, in a few years, Bakewell effected in cattle, and Western in sheep, by this identical principle of selection?

To give an imaginary example from changes in progress on an island:—let the organization of a canine animal which preyed chiefly on rabbits, but sometimes on hares, become slightly plastic; let these same changes cause the number of rabbits very slowly to decrease, and the number of hares to increase; the effect of this would be that the fox or dog would be driven to try to catch more hares: his organization, however, being slightly plastic, those individuals with the lightest forms, longest limbs, and best eyesight, let the difference be ever so small, would be slightly favoured, and would tend to live longer, and to survive during that time of the year when food was scarcest; they would also rear more young, which would tend to inherit these slight peculiarities. The less fleet ones would be rigidly destroyed. I can see no more reason to doubt that these causes in a thousand generations would produce a marked effect, and adapt the form of the fox or dog to the catching of hares instead of rabbits, than that greyhounds can be improved by selection and careful breeding. So would it be with plants under similar circumstances. If the number of individuals of a species with plumed seeds could be increased by greater powers of dissemination within its own area

(that is, if the check to increase fell chiefly on the seeds), those seeds which were provided with ever so little more down, would in the long run be most disseminated; hence a greater number of seeds thus formed would germinate, and would tend to produce plants inheriting the slightly better-adapted down*.

Besides this natural means of selection, by which those individuals are preserved, whether in their egg, or larval, or mature state, which are best adapted to the place they fill in nature, there is a second agency at work in most unisexual animals, tending to produce the same effect, namely, the struggle of the males for the females. These struggles are generally decided by the law of battle, but in the case of birds, apparently, by the charms of their song, by their beauty or their power of courtship, as in the dancing rock-thrush of Guiana. The most vigorous and healthy males, implying perfect adaptation, must generally gain the victory in their contests. This kind of selection, however, is less rigorous than the other; it does not require the death of the less successful, but gives to them fewer descendants. The struggle falls, moreover, at a time of year when food is generally abundant, and perhaps the effect chiefly produced would be the modification of the secondary sexual characters, which are not related to the power of obtaining food, or to defence from enemies, but to fighting with or rivalling other males. The result of this struggle amongst the males may be compared in some respects to that produced by those agriculturists who pay less attention to the careful selection of all their young animals, and more to the occasional use of a choice mate.

II. *Abstract of a Letter from C. DARWIN, Esq., to Prof. ASA GRAY, Boston, U.S., dated Down, September 5th, 1857.*

1. It is wonderful what the principle of selection by man, that is the picking out of individuals with any desired quality, and breeding from them, and again picking out, can do. Even breeders have been astounded at their own results. They can act on differences inappreciable to an uneducated eye. Selection has been *methodically* followed in *Europe* for only the last half century; but it was occasionally, and even in some degree methodically, followed in the most ancient times. There must have been also a kind of unconscious selection from a remote period, namely in

* I can see no more difficulty in this, than in the planter improving his varieties of the cotton plant.—C. D. 1858.

the preservation of the individual animals (without any thought of their offspring) most useful to each race of man in his particular circumstances. The "roguing," as nurserymen call the destroying of varieties which depart from their type, is a kind of selection. I am convinced that intentional and occasional selection has been the main agent in the production of our domestic races; but however this may be, its great power of modification has been indisputably shown in later times. Selection acts only by the accumulation of slight or greater variations, caused by external conditions, or by the mere fact that in generation the child is not absolutely similar to its parent. Man, by this power of accumulating variations, adapts living beings to his wants—may be said to make the wool of one sheep good for carpets, of another for cloth, &c.

2. Now suppose there were a being who did not judge by mere external appearances, but who could study the whole internal organization, who was never capricious, and should go on selecting for one object during millions of generations; who will say what he might not effect? In nature we have some *slight* variation occasionally in all parts; and I think it can be shown that changed conditions of existence is the main cause of the child not exactly resembling its parents; and in nature geology shows us what changes have taken place, and are taking place. We have almost unlimited time; no one but a practical geologist can fully appreciate this. Think of the Glacial period, during the whole of which the same species at least of shells have existed; there must have been during this period millions on millions of generations.

3. I think it can be shown that there is such an unerring power at work in *Natural Selection* (the title of my book), which selects exclusively for the good of each organic being. The elder De Candolle, W. Herbert, and Lyell have written excellently on the struggle for life; but even they have not written strongly enough. Reflect that every being (even the elephant) breeds at such a rate, that in a few years, or at most a few centuries, the surface of the earth would not hold the progeny of one pair. I have found it hard constantly to bear in mind that the increase of every single species is checked during some part of its life, or during some shortly recurrent generation. Only a few of those annually born can live to propagate their kind. What a trifling difference must often determine which shall survive, and which perish!

4. Now take the case of a country undergoing some change. This will tend to cause some of its inhabitants to vary slightly—

not but that I believe most beings vary at all times enough for selection to act on them. Some of its inhabitants will be exterminated; and the remainder will be exposed to the mutual action of a different set of inhabitants, which I believe to be far more important to the life of each being than mere climate. Considering the infinitely various methods which living beings follow to obtain food by struggling with other organisms, to escape danger at various times of life, to have their eggs or seeds disseminated, &c. &c., I cannot doubt that during millions of generations individuals of a species will be occasionally born with some slight variation, profitable to some part of their economy. Such individuals will have a better chance of surviving, and of propagating their new and slightly different structure; and the modification may be slowly increased by the accumulative action of natural selection to any profitable extent. The variety thus formed will either coexist with, or, more commonly, will exterminate its parent form. An organic being, like the woodpecker or misseltoe, may thus come to be adapted to a score of contingences—natural selection accumulating those slight variations in all parts of its structure, which are in any way useful to it during any part of its life.

5. Multiform difficulties will occur to every one, with respect to this theory. Many can, I think, be satisfactorily answered. *Natura non facit saltum* answers some of the most obvious. The slowness of the change, and only a very few individuals undergoing change at any one time, answers others. The extreme imperfection of our geological records answers others.

6. Another principle, which may be called the principle of divergence, plays, I believe, an important part in the origin of species. The same spot will support more life if occupied by very diverse forms. We see this in the many generic forms in a square yard of turf, and in the plants or insects on any little uniform islet, belonging almost invariably to as many genera and families as species. We can understand the meaning of this fact amongst the higher animals, whose habits we understand. We know that it has been experimentally shown that a plot of land will yield a greater weight if sown with several species and genera of grasses, than if sown with only two or three species. Now, every organic being, by propagating so rapidly, may be said to be striving its utmost to increase in numbers. So it will be with the offspring of any species after it has become diversified into varieties, or subspecies, or true species. And it follows, I think, from the foregoing facts, that the varying offspring of each species will try

(only few will succeed) to seize on as many and as diverse places in the economy of nature as possible. Each new variety or species, when formed, will generally take the place of, and thus exterminate its less well-fitted parent. This I believe to be the origin of the classification and affinities of organic beings at all times; for organic beings always *seem* to branch and sub-branch like the limbs of a tree from a common trunk, the flourishing and diverging twigs destroying the less vigorous—the dead and lost branches rudely representing extinct genera and families.

This sketch is *most* imperfect; but in so short a space I cannot make it better. Your imagination must fill up very wide blanks.

C. DARWIN.

III. *On the Tendency of Varieties to depart indefinitely from the Original Type.* By ALFRED RUSSEL WALLACE.

One of the strongest arguments which have been adduced to prove the original and permanent distinctness of species is, that *varieties* produced in a state of domesticity are more or less unstable, and often have a tendency, if left to themselves, to return to the normal form of the parent species; and this instability is considered to be a distinctive peculiarity of all varieties, even of those occurring among wild animals in a state of nature, and to constitute a provision for preserving unchanged the originally created distinct species.

In the absence or scarcity of facts and observations as to *varieties* occurring among wild animals, this argument has had great weight with naturalists, and has led to a very general and somewhat prejudiced belief in the stability of species. Equally general, however, is the belief in what are called “permanent or true varieties,”—races of animals which continually propagate their like, but which differ so slightly (although constantly) from some other race, that the one is considered to be a *variety* of the other. Which is the *variety* and which the original *species*, there is generally no means of determining, except in those rare cases in which the one race has been known to produce an offspring unlike itself and resembling the other. This, however, would seem quite incompatible with the “permanent invariability of species,” but the difficulty is overcome by assuming that such varieties have strict limits, and can never again vary further from the original type, although they may return to it, which, from the

analogy of the domesticated animals, is considered to be highly probable, if not certainly proved.

It will be observed that this argument rests entirely on the assumption, that *varieties* occurring in a state of nature are in all respects analogous to or even identical with those of domestic animals, and are governed by the same laws as regards their permanence or further variation. But it is the object of the present paper to show that this assumption is altogether false, that there is a general principle in nature which will cause many *varieties* to survive the parent species, and to give rise to successive variations departing further and further from the original type, and which also produces, in domesticated animals, the tendency of varieties to return to the parent form.

The life of wild animals is a struggle for existence. The full exertion of all their faculties and all their energies is required to preserve their own existence and provide for that of their infant offspring. The possibility of procuring food during the least favourable seasons, and of escaping the attacks of their most dangerous enemies, are the primary conditions which determine the existence both of individuals and of entire species. These conditions will also determine the population of a species; and by a careful consideration of all the circumstances we may be enabled to comprehend, and in some degree to explain, what at first sight appears so inexplicable—the excessive abundance of some species, while others closely allied to them are very rare.

The general proportion that must obtain between certain groups of animals is readily seen. Large animals cannot be so abundant as small ones; the carnivora must be less numerous than the herbivora; eagles and lions can never be so plentiful as pigeons and antelopes; the wild asses of the Tartarian deserts cannot equal in numbers the horses of the more luxuriant prairies and pampas of America. The greater or less fecundity of an animal is often considered to be one of the chief causes of its abundance or scarcity; but a consideration of the facts will show us that it really has little or nothing to do with the matter. Even the least prolific of animals would increase rapidly if unchecked, whereas it is evident that the animal population of the globe must be stationary, or perhaps, through the influence of man, decreasing. Fluctuations there may be; but permanent increase, except in restricted localities, is almost impossible. For example, our own observation must convince us that birds do not go on increasing every year in a geometrical ratio, as they would do, were there not

some powerful check to their natural increase. Very few birds produce less than two young ones each year, while many have six, eight, or ten; four will certainly be below the average; and if we suppose that each pair produce young only four times in their life, that will also be below the average, supposing them not to die either by violence or want of food. Yet at this rate how tremendous would be the increase in a few years from a single pair! A simple calculation will show that in fifteen years each pair of birds would have increased to nearly ten millions! whereas we have no reason to believe that the number of the birds of any country increases at all in fifteen or in one hundred and fifty years. With such powers of increase the population must have reached its limits, and have become stationary, in a very few years after the origin of each species. It is evident, therefore, that each year an immense number of birds must perish—as many in fact as are born; and as on the lowest calculation the progeny are each year twice as numerous as their parents, it follows that, whatever be the average number of individuals existing in any given country, *twice that number must perish annually*,—a striking result, but one which seems at least highly probable, and is perhaps under rather than over the truth. It would therefore appear that, as far as the continuance of the species and the keeping up the average number of individuals are concerned, large broods are superfluous. On the average all above *one* become food for hawks and kites, wild cats and weasels, or perish of cold and hunger as winter comes on. This is strikingly proved by the case of particular species; for we find that their abundance in individuals bears no relation whatever to their fertility in producing offspring. Perhaps the most remarkable instance of an immense bird population is that of the passenger pigeon of the United States, which lays only one, or at most two eggs, and is said to rear generally but one young one. Why is this bird so extraordinarily abundant, while others producing two or three times as many young are much less plentiful? The explanation is not difficult. The food most congenial to this species, and on which it thrives best, is abundantly distributed over a very extensive region, offering such differences of soil and climate, that in one part or another of the area the supply never fails. The bird is capable of a very rapid and long-continued flight, so that it can pass without fatigue over the whole of the district it inhabits, and as soon as the supply of food begins to fail in one place is able to discover a fresh feeding-ground. This example strikingly shows us that the procuring a constant supply

of wholesome food is almost the sole condition requisite for ensuring the rapid increase of a given species, since neither the limited fecundity, nor the unrestrained attacks of birds of prey and of man are here sufficient to check it. In no other birds are these peculiar circumstances so strikingly combined. Either their food is more liable to failure, or they have not sufficient power of wing to search for it over an extensive area, or during some season of the year it becomes very scarce, and less wholesome substitutes have to be found; and thus, though more fertile in offspring, they can never increase beyond the supply of food in the least favourable seasons. Many birds can only exist by migrating, when their food becomes scarce, to regions possessing a milder, or at least a different climate, though, as these migrating birds are seldom excessively abundant, it is evident that the countries they visit are still deficient in a constant and abundant supply of wholesome food. Those whose organization does not permit them to migrate when their food becomes periodically scarce, can never attain a large population. This is probably the reason why woodpeckers are scarce with us, while in the tropics they are among the most abundant of solitary birds. Thus the house sparrow is more abundant than the redbreast, because its food is more constant and plentiful,—seeds of grasses being preserved during the winter, and our farm-yards and stubble-fields furnishing an almost inexhaustible supply. Why, as a general rule, are aquatic, and especially sea birds, very numerous in individuals? Not because they are more prolific than others, generally the contrary; but because their food never fails, the sea-shores and river-banks daily swarming with a fresh supply of small mollusca and crustacea. Exactly the same laws will apply to mammals. Wild cats are prolific and have few enemies; why then are they never as abundant as rabbits? The only intelligible answer is, that their supply of food is more precarious. It appears evident, therefore, that so long as a country remains physically unchanged, the numbers of its animal population cannot materially increase. If one species does so, some others requiring the same kind of food must diminish in proportion. The numbers that die annually must be immense; and as the individual existence of each animal depends upon itself, those that die must be the weakest—the very young, the aged, and the diseased,—while those that prolong their existence can only be the most perfect in health and vigour—those who are best able to obtain food regularly, and avoid their numerous enemies. It is, as we commenced by remarking, “a struggle for existence,” in

which the weakest and least perfectly organized must always succumb.

Now it is clear that what takes place among the individuals of a species must also occur among the several allied species of a group,—viz. that those which are best adapted to obtain a regular supply of food, and to defend themselves against the attacks of their enemies and the vicissitudes of the seasons, must necessarily obtain and preserve a superiority in population; while those species which from some defect of power or organization are the least capable of counteracting the vicissitudes of food, supply, &c., must diminish in numbers, and, in extreme cases, become altogether extinct. Between these extremes the species will present various degrees of capacity for ensuring the means of preserving life; and it is thus we account for the abundance or rarity of species. Our ignorance will generally prevent us from accurately tracing the effects to their causes; but could we become perfectly acquainted with the organization and habits of the various species of animals, and could we measure the capacity of each for performing the different acts necessary to its safety and existence under all the varying circumstances by which it is surrounded, we might be able even to calculate the proportionate abundance of individuals which is the necessary result.

If now we have succeeded in establishing these two points—1st, *that the animal population of a country is generally stationary, being kept down by a periodical deficiency of food, and other checks*; and, 2nd, *that the comparative abundance or scarcity of the individuals of the several species is entirely due to their organization and resulting habits, which, rendering it more difficult to procure a regular supply of food and to provide for their personal safety in some cases than in others, can only be balanced by a difference in the population which have to exist in a given area*—we shall be in a condition to proceed to the consideration of *varieties*, to which the preceding remarks have a direct and very important application.

Most or perhaps all the variations from the typical form of a species must have some definite effect, however slight, on the habits or capacities of the individuals. Even a change of colour might, by rendering them more or less distinguishable, affect their safety; a greater or less development of hair might modify their habits. More important changes, such as an increase in the power or dimensions of the limbs or any of the external organs, would more or less affect their mode of procuring food or the range of

country which they inhabit. It is also evident that most changes would affect, either favourably or adversely, the powers of prolonging existence. An antelope with shorter or weaker legs must necessarily suffer more from the attacks of the feline carnivora; the passenger pigeon with less powerful wings would sooner or later be affected in its powers of procuring a regular supply of food; and in both cases the result must necessarily be a diminution of the population of the modified species. If, on the other hand, any species should produce a variety having slightly increased powers of preserving existence, that variety must inevitably in time acquire a superiority in numbers. These results must follow as surely as old age, intemperance, or scarcity of food produce an increased mortality. In both cases there may be many individual exceptions; but on the average the rule will invariably be found to hold good. All varieties will therefore fall into two classes—those which under the same conditions would never reach the population of the parent species, and those which would in time obtain and keep a numerical superiority. Now, let some alteration of physical conditions occur in the district—a long period of drought, a destruction of vegetation by locusts, the irruption of some new carnivorous animal seeking “pastures new”—any change in fact tending to render existence more difficult to the species in question, and tasking its utmost powers to avoid complete extermination; it is evident that, of all the individuals composing the species, those forming the least numerous and most feebly organized variety would suffer first, and, were the pressure severe, must soon become extinct. The same causes continuing in action, the parent species would next suffer, would gradually diminish in numbers, and with a recurrence of similar unfavourable conditions might also become extinct. The superior variety would then alone remain, and on a return to favourable circumstances would rapidly increase in numbers and occupy the place of the extinct species and variety.

The *variety* would now have replaced the *species*, of which it would be a more perfectly developed and more highly organized form. It would be in all respects better adapted to secure its safety, and to prolong its individual existence and that of the race. Such a variety *could not* return to the original form; for that form is an inferior one, and could never compete with it for existence. Granted, therefore, a “tendency” to reproduce the original type of the species, still the variety must ever remain preponderant in numbers, and under adverse physical conditions *again alone survive*.

But this new, improved, and populous race might itself, in course of time, give rise to new varieties, exhibiting several diverging modifications of form, any of which, tending to increase the facilities for preserving existence, must, by the same general law, in their turn become predominant. Here, then, we have *progression and continued divergence* deduced from the general laws which regulate the existence of animals in a state of nature, and from the undisputed fact that varieties do frequently occur. It is not, however, contended that this result would be invariable; a change of physical conditions in the district might at times materially modify it, rendering the race which had been the most capable of supporting existence under the former conditions now the least so, and even causing the extinction of the newer and, for a time, superior race, while the old or parent species and its first inferior varieties continued to flourish. Variations in unimportant parts might also occur, having no perceptible effect on the life-preserving powers; and the varieties so furnished might run a course parallel with the parent species, either giving rise to further variations or returning to the former type. All we argue for is, that certain varieties have a tendency to maintain their existence longer than the original species, and this tendency must make itself felt; for though the doctrine of chances or averages can never be trusted to on a limited scale, yet, if applied to high numbers, the results come nearer to what theory demands, and, as we approach to an infinity of examples, become strictly accurate. Now the scale on which nature works is so vast—the numbers of individuals and periods of time with which she deals approach so near to infinity, that any cause, however slight, and however liable to be veiled and counteracted by accidental circumstances, must in the end produce its full legitimate results.

Let us now turn to domesticated animals, and inquire how varieties produced among them are affected by the principles here enunciated. The essential difference in the condition of wild and domestic animals is this,—that among the former, their well-being and very existence depend upon the full exercise and healthy condition of all their senses and physical powers, whereas, among the latter, these are only partially exercised, and in some cases are absolutely unused. A wild animal has to search, and often to labour, for every mouthful of food—to exercise sight, hearing, and smell in seeking it, and in avoiding dangers, in procuring shelter from the inclemency of the seasons, and in providing for the subsistence and safety of its offspring. There is no muscle of

its body that is not called into daily and hourly activity; there is no sense or faculty that is not strengthened by continual exercise. The domestic animal, on the other hand, has food provided for it, is sheltered, and often confined, to guard it against the vicissitudes of the seasons, is carefully secured from the attacks of its natural enemies, and seldom even rears its young without human assistance. Half of its senses and faculties are quite useless; and the other half are but occasionally called into feeble exercise, while even its muscular system is only irregularly called into action.

Now when a variety of such an animal occurs, having increased power or capacity in any organ or sense, such increase is totally useless, is never called into action, and may even exist without the animal ever becoming aware of it. In the wild animal, on the contrary, all its faculties and powers being brought into full action for the necessities of existence, any increase becomes immediately available, is strengthened by exercise, and must even slightly modify the food, the habits, and the whole economy of the race. It creates as it were a new animal, one of superior powers, and which will necessarily increase in numbers and outlive those inferior to it.

Again, in the domesticated animal all variations have an equal chance of continuance; and those which would decidedly render a wild animal unable to compete with its fellows and continue its existence are no disadvantage whatever in a state of domesticity. Our quickly fattening pigs, short-legged sheep, pouter pigeons, and poodle dogs could never have come into existence in a state of nature, because the very first step towards such inferior forms would have led to the rapid extinction of the race; still less could they now exist in competition with their wild allies. The great speed but slight endurance of the race horse, the unwieldy strength of the ploughman's team, would both be useless in a state of nature. If turned wild on the pampas, such animals would probably soon become extinct, or under favourable circumstances might each lose those extreme qualities which would never be called into action, and in a few generations would revert to a common type, which must be that in which the various powers and faculties are so proportioned to each other as to be best adapted to procure food and secure safety,—that in which by the full exercise of every part of his organization the animal can alone continue to live. Domestic varieties, when turned wild, *must* return to something near the type of the original wild stock, or *become altogether extinct*.

We see, then, that no inferences as to varieties in a state of nature can be deduced from the observation of those occurring among domestic animals. The two are so much opposed to each other in every circumstance of their existence, that what applies to the one is almost sure not to apply to the other. Domestic animals are abnormal, irregular, artificial; they are subject to varieties which never occur and never can occur in a state of nature: their very existence depends altogether on human care; so far are many of them removed from that just proportion of faculties, that true balance of organization, by means of which alone an animal left to its own resources can preserve its existence and continue its race.

The hypothesis of Lamarck—that progressive changes in species have been produced by the attempts of animals to increase the development of their own organs, and thus modify their structure and habits—has been repeatedly and easily refuted by all writers on the subject of varieties and species, and it seems to have been considered that when this was done the whole question has been finally settled; but the view here developed renders such an hypothesis quite unnecessary, by showing that similar results must be produced by the action of principles constantly at work in nature. The powerful retractile talons of the falcon- and the cat-tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, *those always survived longest which had the greatest facilities for seizing their prey*. Neither did the giraffe acquire its long neck by desiring to reach the foliage of the more lofty shrubs, and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual *at once secured a fresh range of pasture over the same ground as their shorter-necked companions, and on the first scarcity of food were thereby enabled to outlive them*. Even the peculiar colours of many animals, especially insects, so closely resembling the soil or the leaves or the trunks on which they habitually reside, are explained on the same principle; for though in the course of ages varieties of many tints may have occurred, *yet those races having colours best adapted to concealment from their enemies would inevitably survive the longest*. We have also here an acting cause to account for that balance so often observed in nature,—a deficiency in one set of organs always being compensated by an increased development of some others—powerful wings accompanying weak

feet, or great velocity making up for the absence of defensive weapons; for it has been shown that all varieties in which an unbalanced deficiency occurred could not long continue their existence. The action of this principle is exactly like that of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow. An origin such as is here advocated will also agree with the peculiar character of the modifications of form and structure which obtain in organized beings—the many lines of divergence from a central type, the increasing efficiency and power of a particular organ through a succession of allied species, and the remarkable persistence of unimportant parts such as colour, texture of plumage and hair, form of horns or crests, through a series of species differing considerably in more essential characters. It also furnishes us with a reason for that “more specialized structure” which Professor Owen states to be a characteristic of recent compared with extinct forms, and which would evidently be the result of the progressive modification of any organ applied to a special purpose in the animal economy.

We believe we have now shown that there is a tendency in nature to the continued progression of certain classes of *varieties* further and further from the original type—a progression to which there appears no reason to assign any definite limits—and that the same principle which produces this result in a state of nature will also explain why domestic varieties have a tendency to revert to the original type. This progression, by minute steps, in various directions, but always checked and balanced by the necessary conditions, subject to which alone existence can be preserved, may, it is believed, be followed out so as to agree with all the phenomena presented by organized beings, their extinction and succession in past ages, and all the extraordinary modifications of form, instinct, and habits which they exhibit.

Ternate, February, 1858.

Contributions to the Anatomy and Natural History of the Cetacea. By R. KNOX, Esq., M.D., F.R.S.E. Communicated by the Secretary.

[Received Oct. 6, 1857.]

Part I. THE DOLPHINS.

THE dissection of the Cetacea, and more especially of the larger kinds, is attended with great difficulty, and not unfrequently entails heavy expenses on those who attempt it. For these reasons I have thought that zoologists might be pleased to have, even now, submitted to them the results of numerous dissections made many years ago, when, not stinted in means, and having the aid of excellent assistants, I attempted the dissection even of the gigantic Arctic Rorqual, the largest, perhaps, of all living beings. Certain of the details have been from time to time laid before the public, but in an extremely scattered and incomplete form, and without the illustrations (artistic), which explain so much better than any verbal description. The greater part is still before me in manuscript. It is my intention in the following contributions to endeavour to connect them together, adding to those already published many facts I find in MSS. The original drawings, made by my brother and by Messrs. Edward Forbes and Henry Goodsir (who were at that time my students and assistants), are still in my possession.

Determination of Species.—The determination of species as regards the *Cetacea* is one of much difficulty; Cuvier met this difficulty by an appeal to anatomy. The number of vertebræ composing the vertebral column (exclusive of the cephalic) seemed to me a tolerably secure guide in the determination of species,—being aware, however, that some doubted the method, believing that the number of the vertebræ might vary, first, with the individual, secondly with the age of the specimen. I still continue to be of my original opinion, that the number of vertebræ comprising the vertebral column, properly so called, may safely be trusted in determining the species of the *Cetacea*; and with this view I drew up the following Table, excepting from it the genus *Dugong*, which I have never considered to be a *Cetacean* :—

Tabular View of the Number of the Vertebrae in certain Cetacea.
(Cephalic vertebrae excluded.)

| SPECIES. | Authorities. | | | | |
|---|--------------|-----------|-------|------------|----------------------|
| | CUVIER. | RUDOLPHI. | KNOX. | J. HUNTER. | HUNTER (Glasgow.) |
| 1. MYSTICETUS. | | | | | |
| Skeleton of the fœtus (the cervical reckoned as 7) of the <i>Mysticetus</i> <i>borealis</i> , Greenland... | | | 48 | | |
| Adult <i>Mysticetus</i> , Whale of Commerce . | unknown | | | | |
| <i>B. Mysticetus australis</i> , True Whale of the Cape Seas..... | 59 | | | | |
| 2. BALENOPTERA. | | | | | |
| Gigantic Northern Ror- qual | | | 65 | | |
| Specimen of Rorqual de- scribed by Rudolphi . | | 54 | | | |
| <i>B. rostrata</i> of Fabri- cius ; on the authority of Van Beneden : | | | | | |
| A. Rorqual | | | | | 48 |
| Great Whale at Ant- werp. Van Beneden. | | | | | |
| Species not stated ... | | | | | 61 or 62. |
| The lesser Rorqual of the North..... | | | 48 | 46 | 46 |
| Great Rorqual of the Cape..... | 52 | | | | |
| 3. PHYSETER. | | | | | |
| Sperm Whale or Ca- chalot | 60 | | | | |
| 4. DELPHINUS. | | | | | |
| <i>D. Delphis</i> | 67 | | | | |
| <i>D. Delphis</i> . In my museum | | | 81 | | |
| <i>D. Delphis</i> . In the Museum of Dr. R. Hunter, Glasgow..... | | | | | 90 |
| <i>D. Delphis</i> . Dissected by John Hunter | | | | 60 51 | |
| <i>D. Phocæna</i> | 66 | | 65 | | |
| <i>D. Ebsenii</i> . Van Bene- den | | | | | 90 |

In a late number of the 'Bulletins of the Royal Academy of Brussels' I find some valuable remarks in respect of these points by M. Van Beneden. He praises, and deservedly, no doubt, the exertions of M. Eschricht to collect a proper Museum of the Cetacea. It appears, according to M. Eschricht, that at no age whatever do we find in true whales (meaning, I presume, the

Mysticetus borealis and *australis*) any distinct vertebræ in the cervical region as in other mammals. A fusion of all into one bone or cartilage seems to take place even in the youngest foetus. In the foetus examined by me of this species (a specimen removed from the uterus of a true *Mysticetus* killed in the Greenland seas), I do not recollect the precise appearance of the cervical vertebræ; but the skeleton is in existence, and shall be referred to. To the skeleton of the Rorqual now in the Museum at Antwerp, and which seems to me of the same species as the one I dissected in Scotland (and of which the skeleton, prepared with infinite care by my brother and myself, was presented by me to the Town Council of Edinburgh, and is now preserved in the Zoological Gardens of the same city), he gives the following vertebræ:—

| | |
|--|----------|
| Skeleton of the Rorqual at Antwerp—Cervical .. | 7 |
| Dorsal .. | 14–15 |
| Lumbar .. | 15 |
| Caudal .. | 25* |
| <hr/> | |
| Total | 61 or 62 |

In the skeleton of the Great Rorqual now in the Zoological Gardens at Edinburgh, and originally dissected and prepared by my brother and myself, these vertebræ are—

| | |
|-------------------------|----|
| Cervical | 7 |
| Dorsal | 15 |
| Lumbar and Caudal | 43 |
| <hr/> | |
| Total.... | 65 |

In that of the Lesser Rorqual I dissected in 1830, the skeleton of which I think is still preserved in the Museum of the University of Edinburgh, we found—

| | |
|-----------------|-----------|
| | Vertebræ. |
| Cervical | 7 |
| Dorsal | 11 |
| Lumbar | 13 |
| Caudal | 17 |
| <hr/> | |
| Total..... | 48 |

The specimen was that of a young animal, and of the same species,

* It is stated that some of the last of these are of wood. The skeleton in Edinburgh is perfect.

I believe, as the one described by Mr. Hunter and Fabricius ; it is a distinct species, and not merely the young of the Great Rorqual.

I shall return to the Dugong, as not being a Cetacean, in a future Section : its skeleton has been examined in a masterly way by De Blainville, an anatomist and observer of the highest order, since the time I wrote and published my Memoir on the Dugong.

The first great step in the anatomy of the Cetacea is unquestionably due to Cuvier ; but his dissections were almost confined to the genus *Delphinus*, or the common Porpoise of our coasts. I repeated all his dissections, and found them, as they almost always were, scrupulously exact ; but when I came to examine Cetacea with whalebone instead of teeth, I was surprised to find how different, in fact, the anatomy of the two great families was. Scarcely in any great natural family do we find Cuvier's favourite theory of anatomical and physiological co-relations so entirely at fault as in the Cetacea. The teeth or whalebone, as natural-history characters, lead to no results ; the whole structure of the interior defies all *à-priori* reasoning. The brain in whalebone-whales does not fill the interior of the cranium ; so that the capacity of the one is no measure of the solid bulk of the other. Their food is various, having no relation to the teeth or buccal appendages ; vascular structures surround the spinal marrow, and extend in the *Balænopteræ* into the cavity of the cranium, which seem to be without any analogy in other mammals, or, at the least, a very obscure one, and whose functions are wholly unknown.

Cetacea might with some propriety be divided into whales with whalebone, and whales with teeth. Those with whalebone have rudimentary teeth in both jaws in the foetal state. Fossil Cetacea exist, and they seem to have been of both kinds, but, no doubt, were generically and specifically distinct from the recent. Judging from the remains of those I have seen, I am inclined to think that those with teeth were of a stronger and firmer build in the skeleton than those called recent ; that the neck was longer, and the caudal portion of the column shorter than in the recent kinds, and that they approached the Saurians in form. There is a remarkable want of symmetry in the crania of some of the Cetacea ; but most remarkable is the cranium of the Narwhal. Of this fact I have already spoken, in the article published in the Transactions of the Royal Society of Edinburgh.

Delphinus Phocæna. Dissection of a small Cetacean sent to me from Orkney in the month of May 1835.—This species is said to abound on the coasts, and to furnish a kind of fishery to the in-

habitants. On dissection we found 81 vertebræ, exclusive of the cephalic. The species must be quite distinct from those previously and subsequently examined by myself and many others, in which the number of vertebræ ranged from 61 to 66. It is also, I think, distinct from the specimen I saw in Dr. R. Hunter's Museum in Glasgow, in which the number of vertebræ was 90, exclusive of the cephalic in all the cases. Thus it stands with regard to the Cetacea called Porpoises and Dolphins.

In certain species of *Delphinus* the vertical column is composed of 61 vertebræ, in others of 65, in others of 66, in others of 81, in others of 90.

The specimen I now describe was, no doubt, that of a young animal; and the skeleton was prepared, consequently, as a natural one. This method has the advantage of security against the loss of any important osseous structures, which too frequently happens when the bones require to be macerated. The bones contained little oil, and weighed, head included, only $7\frac{1}{4}$ lbs.; the whole animal, when entire, weighed 14 stone, or 196 lbs.; the skeleton therefore was about a twenty-fourth part of the whole weight. It was a female. The external nostrils terminated in a single orifice of a semilunar shape, with the concavity turned towards the snout. Measurements of young animals have not the importance of those of the adult; but I give them here because I think that the specimen, although young, had nearly attained its full growth:—

| | ft. | in. |
|---|-----|-----------------|
| Total length over the dorsum | 6 | $5\frac{2}{8}$ |
| „ „ lateral surface | 6 | $11\frac{2}{8}$ |
| „ „ abdominal surface | 6 | $11\frac{2}{8}$ |
| From the snout to the nostrils | 0 | $11\frac{4}{8}$ |
| From the nostrils to the dorsal fin | 1 | $6\frac{4}{8}$ |
| Base of the dorsal fin | 0 | 11 |
| From dorsal fin to foot of tail | 3 | $0\frac{2}{8}$ |
| Breadth of pectoral limb | 0 | $4\frac{4}{8}$ |
| From the snout to the organs of generation .. | 3 | $9\frac{4}{8}$ |
| Circumference anterior to the arm | 2 | 9 |
| „ „ dorsal fin | 3 | $2\frac{4}{8}$ |
| „ posterior to dorsal fin | 2 | 10 |
| „ at setting on of the tail | 0 | $8\frac{4}{8}$ |
| Length of pectoral limb | 0 | 10 |
| Breadth of tail | 1 | 2 |
| Greatest height of the dorsal fin | 0 | 9 |

From the notes taken at the time, I find that my brother remarks that the Dolphin of Orkney differed a good deal in shape from those found in the Forth and seas in the South of Scotland. There were, moreover, 16 more vertebræ than in the skeleton of the Common Porpoise of authors. The teeth generally weighed $2\frac{1}{2}$ grains each.

Further, the muscles of the tongue, intrinsic as well as extrinsic, were extremely well developed. The isthmus faucium was 3 inches long. All this part was extremely glandular. A well-marked muscular gullet followed, composed of two layers of muscular fibres,—one circular internally, and one longitudinal externally. These latter sent a slip to the base of the arytænoid cartilages. The mucous membrane of the gullet had no true epidermic covering, and in this respect differed remarkably from the first gastric compartment, from which a cuticular lining could be peeled off, as strong as that from the sole of the foot in man. The larynx presented that organization so well described by the illustrious Cuvier, and which I believe to be peculiar to the whales with teeth. It differs very much, as I explained long ago, in its arrangement from that of Whalebone Whales,—a fact of which I think Cuvier was not aware. The cricoid cartilage was imperfect in form; the hyo-epiglottic muscles very strong. The proper arytænoid were present, and strong, but did not extend so high as in man; the thyro-arytænoid muscles were very fully developed. In the interior of the larynx there were no projections nor ventricles, no cuneiform cartilages, nor cornicula laryngis. The rings of the trachea formed complete circles.

Stomach.—The cuticular lining is limited to the first cavity or compartment. It is in the second compartment that is found the curious glandular arrangement first, I believe, described by me in the 'Transactions of the Royal Society of Edinburgh.' This structure is most probably not limited to the second compartment. There are four distinct compartments in the stomach of this animal. A dilated duodenum follows, 6 inches in length. It is possible that this may have been in some instances mistaken for a stomach. The valvulæ conniventes commence with the jejunum; these are longitudinal, and extend to within about 6 inches of the anus, terminating at a point where the intestine seems enlarged. The length of the intestines, large and small, was 90 feet; circumference generally about 2 inches. Thousands and tens of thousands of parasitical worms were found in the stomach, but none in the intestine. In the stomach also we found four mandibles of

the cuttlefish, but no remains of anything in the intestines, and no parasites.

Heart and Vessels.—The heart weighed exactly one pound. The Eustachian valve was small, that of Thebesius imperfect. The aorta proceeded for about 3 inches of its course before giving off any branches. At a point corresponding to the 15th or 16th lumbar vertebra the vessel divided into the common iliacs. The *art. sacri media*, its continuation, continued its course protected by the V-bones, and giving off branches corresponding to the inter-vertebral spaces.

Brain and Nervous System.—The erectile tissue surrounding the spinal cord and origin of the spinal nerves in the Cetacea did not extend into the interior of the cranium. The entire encephalic mass weighed $2\frac{1}{2}$ lbs.: cerebrum, 2 lbs.; cerebellum, $\frac{1}{4}$; pons and medulla, $\frac{1}{4}=2\frac{1}{2}$. Compared with a drawing of Camper of the *Delphinus Phocæna*, the brain was found to differ remarkably, in being much broader in the line of the middle and posterior lobes. In no animal did I ever find the fibrous structure of the brain so well marked; and this extended to the cerebellum *. I give here some measurements of the brain, which may be of use to future observers. The brain is short from before backwards, but broad transversely:—

| | |
|---|------------------------|
| Antero-posterior diameter | $5\frac{2}{8}$ inches. |
| Breadth | 8 „ |
| Greatest breadth of the cerebellum | 4 „ |
| Length of the cerebellar hemisphere | $4\frac{6}{8}$ „ |
| Depth of ditto | $3\frac{2}{8}$ „ |
| Weight of the encephalic mass | $2\frac{1}{2}$ lbs. |
| Depth of the interhemispherical fissure | $1\frac{2}{8}$ inches. |
| Length of the corpus callosum | $1\frac{7}{8}$ „ |
| Weight of cerebrum | 2 |
| „ cerebellum | $0\frac{1}{4}$ |
| „ the pons and med. oblongata | $0\frac{1}{4}$ |
| } = $2\frac{1}{2}$ lbs. | |

Nerves.—The 7th pair was found to be unexpectedly large and firm, including both portions. The anterior roots of the spinal nerves were far more numerous than the posterior or dorsal.

* “The substance of the brain is more visibly fibrous than I ever saw it in any other animal, the fibres passing from the ventricles as from a centre to the circumference, which fibrous texture is also continued through the cortical substance.”—HUNTER, “On Whales,” ‘Animal Economy,’ Palmer’s edit. p. 373.

Muscles.—The panniculus carnosus, strong and fleshy, extended nearly over the whole trunk. The recti abdominis were powerful, and attached inferiorly in this way :—A portion runs to the pelvic bones ; a much stronger to a strong aponeurosis, situated between the anus and the root of the tail.

The erector muscles of the spine (sacrolumbalis, longissimus dorsi and multifidus spinæ) weighed fully 16 lbs. They had but slender costal attachments ; but their spinal (small delicate tendons) were innumerable. The scaleni were very large ; and the vessels held the same relation to them as in man. The serratus magnus was comparatively small. The larger rhomboid had no spinal attachment ; the minor rhomboid seemed to be the larger of the two. The pectorals were comparatively small. The adipose tissue appeared to be wholly confined to the subcutaneous region. The muscles were of a deep brown colour, full of blood, with a short, dark, and well-flavoured fibre : when cooked, they had a strong resemblance in flavour and taste to the flesh of the hare.

Part II. THE BALÆNA WHALES, OR WHALES WITH WHALEBONE.

In February 1834 a young whale of the family of Balæna Whales was caught near the Queensferry, in the Firth of Forth. One much larger had been seen some time before, but escaped. I purchased it for dissection, although I was aware that it was impossible for me, during the hurry of the winter session, to devote much time to it. But I had able assistants (Mr. Henry Goodsir, Mr. Edward Forbes, and my brother), from whom I expected a good deal of aid. Some very beautiful drawings of this whale, made for me by Mr. Edward Forbes and by my brother, are still in my possession.

It was easy to see, by the dorsal fin and by the numerous plaits or folds on the abdominal surface of the throat and chest, before any dissection, that the specimen was a young Balænopteroous whale, differing in a great many points from the true whale or *Mysticetus* : for, 1st, the form of the head was entirely different ; 2nd, it had a dorsal fin ; and, 3rd, occupying the lower surface of the throat and thorax were numerous folds of the integuments. To this class of whales I have been in the habit of giving the name of Rorqual, to distinguish them from the other class of Whalebone Whales, the *Mysticetus* both *borealis* and *australis*.

It appears from my notes, that at that time M. G. Cuvier considered the species I now describe as identical with the Great Rorqual I had described about two years previously; but I felt convinced then, as now, that they form distinct species, and in this opinion some continental anatomists seem to coincide.

Being persuaded that there was some inaccuracy in former drawings of the species, I had the specimen suspended and drawn with great care by Mr. Edward Forbes. This position explained the mechanism of the mouth, showing its great size, even in the short Balæna Whales; its great capacity in the *Mysticetus* had never been doubted.

As to the species, the conclusion I arrived at was, that the specimen belonged to that termed by Fabricius *rostrata*, and that individuals of the species had been seen by John Hunter, Sir James Watson, and Fabricius.

| <i>Measurements.</i> | ft. | in. |
|--|-----|-----------------|
| Total length of the specimen..... | 9 | 11 |
| Circumference immediately behind the pectoral extremities | 5 | 2 |
| Circumference where the folds or rugæ terminated | 4 | 8 $\frac{1}{4}$ |
| Ditto of the tail at its origin..... | 1 | 5 $\frac{1}{2}$ |
| Length from the back fin to the setting on of the tail | 2 | 10 |
| „ from the snout to the ear..... | 3 | 0 |
| „ from snout to nostrils | 1 | 4 |
| „ of lower jaw | 2 | 3 |
| „ of arm; inner side..... | 1 | 3 |
| „ from the angle of the mouth to the arm.. | 1 | 3 |
| „ from snout to arm..... | 2 | 9 |
| „ of tail in depth | 0 | 11 |
| „ of back fin at the base | 0 | 8 |
| Height of back fin | 0 | 8 $\frac{1}{2}$ |
| From top to tip of tail | 2 | 8 $\frac{1}{2}$ |
| Stomach:—1st compartment, in length | 1 | 2 |
| 2nd „ „ | 1 | 4 |
| 3rd „ „ | 0 | 8 |
| 4th „ „ | 0 | 7 |
| 5th „ „ | 0 | 3 |
| Spleen weighed 4 ounces; its length was | 0 | 5 |
| Liver, 9 lbs. | | |
| Small intestines, length | 20 | 0 |

distinct as in man. In the rectum the folds of the mucous membrane were transverse.

Organs of Respiration.—The external nostrils were double; and the cavities of the nostrils provided with the remarkable cartilages and muscular apparatus I discovered and described in the anatomy of the Great Rorqual. In this specimen they were about 4 inches in length, but of as many feet in the large Rorqual. The mode of breathing in the Rorquals does not differ much from that in man, with the exception of the apparatus of the protruding cartilages, which in man are rudimentary.

The *Olfactory Nerves* were quite as large as in other mammals; and in this respect the Balæna Whales are quite unlike the Dolphins*.

The trachea communicated, near its upper part, with a sac or pouch; the lungs were each composed of a single lobe. The rings of the trachea were mostly deficient anteriorly. In the heart the foetal arrangements had wholly disappeared. The dura mater seemed divisible into three layers, the external being vascular. A remarkable vascular substance connected with this layer covers the back part of the brain and cerebellum, extending into the spinal canal, and even into the chest. At the base of the brain the vascular plexus was about 2 inches in thickness. It is, as is well known, a sort of erectile tissue, of whose functions we are wholly ignorant. It is not confined to this course, but extends to the neck, and, passing through the foramina intervertebralia, fills the intercostal spaces exterior to the pleura.

There was evidently a canal in the centre of the spinal marrow. Wherever the nerves of the lungs and stomach were traced, they terminated in loops. We did not observe in the Great Rorqual any tracheal pouch like that in the smaller; but it may have escaped notice: if absent in the Great Rorqual, it would be another proof of the distinctness of the species.

The doubts raised by M. St. Hilaire, as to the Whale being a mammal in the true sense of the term, were set aside long ago by an appeal to facts. The young of the Whale tribe suckle like the young of all mammals; nevertheless I showed, in 1834, that

* In his paper "On the Structure of Whales" (Phil. Trans. 1787), Hunter remarks that the organ of smell "is peculiar to the large and small Whalebone Whales." He further remarks, that, "in those that have olfactory nerves, the lateral ventricles are not continued into them as in many quadrupeds;" and he notices "the want of the olfactory nerves in the genus of the Porpoise."—'Anim. Economy,' Palmer's edit. pp. 372, 373, 376.

the lactiferous glands in the *Balenopterae* differ in structure from the same organs in most mammals.

I do not find in my notes anything to add to the description of the Great Rorqual already published in the 'Transactions of the Royal Society of Edinburgh' for 1827, to which I beg leave to refer the reader.

A single remark must be added regarding the nature of the vascular plexus which, in the Cetacea, surrounds the spinal marrow, and extends into the chest. On selecting the artery which seemed to form the plexus, which was, if I rightly recollect, in this instance an intercostal artery, and dissecting it under water, I found, to my surprise, that the artery, so long as I followed it, never gave off any branches, but continued of the same calibre throughout, making innumerable flexuosities or turnings. Thus, on a plexiform mass of this kind being cut across, the first impression is, that a great number of arterial branches or arteries have been divided, whilst in fact the entire plexus seems to be formed of one artery.

As was to be expected of animals so much withdrawn from human observation, there is but little to say on the natural history of the Cetacea properly so called. Their food, no doubt, is various, and seems to have little or no relation to the character of their dentition. The enormous Cachalot, with its vast teeth implanted only in one jaw, is generally understood to prey chiefly on the Cuttlefish. The food of the true Whale, or *Mysticetus*, is well known to be the Clio and other smaller Mollusca, with which certain regions of the ocean abound; the same, or similar, is probably the food of the more active and restless Rorquals, found in both hemispheres. The Dolphins, or Toothed Whales, generally prey, no doubt, on fishes of various kinds; yet, even as regards these, it has been proved by my esteemed friend, the late Mr. Henry Goodsir, that some of the largest, following in the wake of the herring shoals, prey not on these, but on the various microscopic food (the Entomostraca and other marine animals) which I was the first to prove to be the natural food of many excellent gregarious freshwater fish, as the Vendace, Early Loch Leven Trout, the Brown Trout of the Highland and Scottish lakes generally, and of the Herring itself*. It is scarcely necessary to add, that the complex apparatus connected with the exterior

* See Memoirs in the 'Transactions of the Royal Society of Edinburgh' for 1832.

nostrils of the Dolphins is wholly wanting in the *Balæna* Whales,—a fact of which M. Cuvier was not aware when he wrote his celebrated Treatise on Comparative Anatomy.

Appendix.—Since writing the above, I have received an answer to a letter I addressed to my friend, John Goodsir, Esq., Professor of Anatomy in the University of Edinburgh. The request contained in my letter to Mr. Goodsir was, to examine for me the skeleton of a foetal *Mysticetus* now in the University Museum. The foetus from which this skeleton was prepared was removed from the uterus of the mother, killed in the North Seas by the seamen of a whaling ship, by one of my former students, Mr. R. Auld, who presented the specimen to me. The point at issue was the composition of the cervical vertebræ in the true or Greenland Whale, the *Balæna Mysticetus*. M. Van Beneden, to whose memoir I have referred in the commencement of this, says, on the authority of Eschricht, that at no age whatever do we find in true Whales (meaning, I presume, the *Mysticetus borealis* and *australis*) any distinct vertebræ in the cervical region, as in other mammals. A fusion of all into one bone or cartilage seems to take place even in the youngest foetus. Now, I had enjoyed the rare opportunity of dissecting the foetus of the *Mysticetus*, and I knew that the skeleton, prepared with the greatest care, was still preserved in the Museum of the University of Edinburgh. I wrote to Mr. Goodsir to re-examine this point for me, for I did not find in my notes any confirmation of the observations of Eschricht. Mr. Goodsir's reply to my note is as follows:—

“University, Edinburgh,
Sept. 30, 1857.

“MY DEAR SIR,

“In the skeleton of the foetal *Mysticetus* now in the University Museum, the bodies of the axis and atlas have shrivelled up together, having evidently consisted of cartilage only; but the bodies of the five posterior cervical vertebræ are beautifully distinct, having well-formed osseous centres, which give them more of the configuration of the succeeding vertebral bodies than they present in their compressed form in the adult.

“The neural arches in the cervical region of this skeleton are five in number; the two anterior, which are distinctly those of the atlas and axis, have an osseous nodule on each side, where the transverse processes pass off. The third arch belongs to the third vertebra, the fourth and fifth to the sixth and seventh. These three arches are cartilaginous, and present no osseous centres. It

is impossible to determine from the preparation whether the arches of the fourth and fifth vertebræ had been cut away in dissecting the parts, or whether they have shrivelled up in drying; but as the skeleton was very carefully prepared, and as these two arches are deficient (at least laterally) in the adult *Mysticetus*, I presume that the cartilaginous matrices were at least extremely delicate in the fœtus.

"I believe I have stated all the facts, afforded by this skeleton, which bear upon your questions. They appear to me to afford no support to the views to which they refer.

"Yours very sincerely,
(Signed) "JOHN GOODSIR."

The conclusion I arrived at is this,—that the actual number of cervical vertebræ in the *Mysticetus* is, as in most other mammals, seven, and that, notwithstanding their earlier fusion, they are originally quite distinct.

Extract of a Letter from Dr. BAIKIE to Sir JOHN RICHARDSON, M.D., C.B., F.R. & L.S., dated 29th October, 1857, Rabba, on the Qworra.

[Read January 21st, 1858.]

"IN natural history my collection is advancing, especially in skins and skeletons of birds. I am collecting skulls of all the domesticated animals, and skeletons of the sheep and goats. I have got a few fish, including a prettily-marked *Diodon* or *Tetraodon*, probably new, and a *Myletes* which I did not meet with formerly. The *Siluridæ* are the most abundant fishes; and one species closely resembles the *Hypophthalmus*, figured by Rüppell in his 'Fishes of the Nile and Red Sea.' I have not met with another *Polypterus*. I shall get a *Lepidosiren* in the river, and have heard of an electrical fish, I believe a *Malopteruris*, such as I formerly found. I enclose two scales of a fish which is said to grow to the length of 5 feet, but of which I have specimens half that size only,—also a sketch of a curious fish 2½ feet, which I put into spirits; it has neither ventral nor anal fins, a very peculiar caudal, and a slender head, while the dorsal extends along the whole back; eyes very small; teeth numerous and hard, but not sharp." He adds, in a postscript, that he had got the *Lepidosiren*. He had collected

700 species of plants, and numerous fine fruits, which he says "will rejoice Sir William Hooker's heart."

Dr. Baikie's postscript, however, mentions that his vessel had been wrecked about twelve miles above Lagos, and that she sunk in a few minutes after she struck. He does not say what was the fate of his collections, but states that all the party had fever from fatigue and sleeping in swamps after the wreck.—J. R.

Catalogue of the Dipterous Insects collected in the Aru Islands
by Mr. A. R. WALLACE, with Descriptions of New Species.
By FRANCIS WALKER.

ARU ISLAND.

Fam. MYCETOPHILIDÆ, *Haliday*.

Gen. SCIARA, *Meigen*.

Div. A. a., *Meig.* vi. 305.

1. SCIARA SELECTA, n. s. *Mas.* Nigra, cinereo-tomentosa, antennis sat validis, pedibus piceis, alis cinereis, venis costalibus crassis.

Male. Black, with cinereous tomentum; antennæ rather stout; legs piceous; wings greyish; veins black; radial and cubital veins thick; radial vein extending to the fork of the subapical. Length of the body $1\frac{3}{4}$ line; of the wings 4 lines.

Fam. BIBIONIDÆ, *Haliday*.

Gen. PLECIA, *Hoffmansegg*.

2. PLECIA dorsalis, *Walk.* See Vol. I. p. 5.

Fam. CULICIDÆ, *Haliday*.

3. CULEX SCUTELLARIS, n. s. *Mas.* Nigro-fuscus, capite thoraceque argenteo trivittatis, scutello rufescente; abdominis segmentis argenteo fasciatis, genubus et tarsorum posteriorum fasciis niveis; alis subcinereis, venis nigris ciliatis.

Male. Blackish brown. Head and thorax with three silvery stripes, the middle one very distinct; scutellum reddish; pectus with silvery gloss; abdomen with silvery bands, which are narrow above, broad beneath; femora pale towards the base; knees snow-white; hind tarsi with 5 broad snow-white bands; middle tarsi with the first and second joints white at the base; wings slightly greyish; veins black, fringed. Length of the body 3 lines; of the wings 5 lines.

Fam. TIPULIDÆ.

Gen. MEGISTOCERA, *Wied.*

4. *Megistocera tuscana*, *Wied. Auss. Zweifl.* 1. 55. 1.
Inhabits also Java.

Gen. GYNOPLISTIA, *Westw.*

5. *GYNOPLISTIA JURGIOSA*, n. s. *Mas. et Fæm.* Nigra, capite rufescente, alis cinereis, plagis costalibus nigro-fuscis.—*Mas.* Abdomine ochraceo, apice nigro, femoribus basi testaceis.—*Fæm.* Abdomine atro fasciis albidis apice luteo.

Male and Female. Black. Head reddish; antennæ testaceous at the base; thorax testaceous in front; wings greyish, blackish-brown along the costa, and with three subcostal blackish-brown patches, the third continued along the veins towards the hind border. *Male.* Abdomen ochraceous, black at the tip; femora testaceous at the base; halteres testaceous. *Female.* Abdomen deep black, with whitish bands on the sutures; tip luteous. Length of the body 5-6 lines; of the wings 9-10 lines.

Fam. STRATIOMIDÆ, *Haliday.*Gen. PTILOCERA, *Wied.*

6. *Ptilocera quadridentata*. See Vol. I. p. 7.
7. *MASSICYTA INFLATA*, n. s. *Fæm.* Nigra, capite viridi maculis nigris, antennis basi ferrugineis, pectoris callis duobus scutelloque testaceis, abdomine basi sordide albido lineis tribus nigris, fasciis duabus canotomentosis, segmentis tertio quartoque apice ferrugineis, tibiis basi tarsisque albidis, alis subcinereis fusco marginatis, stigmatibus nigricante, halteribus testaceis.
- Female.* Black. Head dull green, with several black spots; mouth testaceous; antennæ dark ferruginous towards the base; two pectoral calli and the scutellum testaceous; abdomen at the base dingy-whitish and semihyaline, and with three black lines; third and fourth segments with hoary bands, their hind borders ferruginous; tibiæ towards the base, and tarsi, whitish; hind tibiæ with the two colours most distinctly marked; wings grey, with broad brownish borders; stigma blackish; veins black; halteres testaceous. Length of the body 6 lines; of the wings 11 lines.
8. *MASSICYTA CERIOIDES*, n. s. *Fæm.* Nigra, capite testaceo maculis nigris, antennis basi ferrugineis, pectoris callis duobus, thoracis vittis duabus interruptis, scutello abdominisque fasciis tribus viridibus, segmento abdominali secundo maculis duabus testaceis, tarsis albis, alis nigricanti-fuscis, halteribus viridibus.

Female. Black. Head testaceous, with some black spots on the vertex. Antennæ dark ferruginous towards the base. An interrupted stripe on each side of the thorax, two pectoral calli, the scutellum, and the hind borders of the second, third, and fourth abdominal segments green. Abdomen testaceous at the base beneath; first band interrupted, having before it two testaceous spots. Knees lurid; tarsi white. Wings blackish brown; stigma and veins black; halteres apple-green. Length of the body 5-6 lines; of the wings 10-12 lines.

Gen. SALDUBA, n. g.

Male. *Corpus* angustum, sublineare. *Caput* transversum; vertex angustus. *Oculi* magni. *Antennæ* capite transverso valde longiores; articuli primo ad septimum breves; flagellum longum, lanceolatum, subarcuatum. *Thorax* longus, subcompressus; scutellum inerme. *Abdomen* planum, thorace paullo longius. *Pedes* graciles; postici longi. *Alæ* angustæ.

Male. Body narrow, nearly linear. Head slightly transverse, nearly as broad as the thorax; vertex narrow. Eyes large. Antennæ shorter than the thorax; joints from the first to the seventh short; flagellum long, lanceolate, slightly curved. Thorax long, slightly increasing in breadth from the head to the base of the wings. Abdomen nearly flat and linear, a little longer than the thorax. Legs slender; hind pair long. Wings narrow; veins complete, distinctly marked; first cubital areolet rather short, divided from the second by the oblique first cubital rim; discal areolet large, hexagonal; subanal and anal veins united at some distance from the border.

9. SALDUBA DIPHYSOIDES, n. s., *Mas.* Nigra, ore flavo, thorace vittis quatuor subauratis, abdominis apice cinereo, pedibus albidis, femoribus posticis apices versus tibiisque posticis nigris, alis cinereis, venis stigmatæque nigris, halteribus testaceis.

Male. Black. Mouth yellow; thorax with four stripes of slightly gilded tomentum; tip of the abdomen with cinereous tomentum; legs whitish, hind femora towards the tips and hind tibiæ black; wings greyish, veins and stigma black; halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. STRATIOMYS.

10. STRATIOMYS CONFERTISSIMA, n. s. *Fæm.* Nigra, subtus ferruginea, capite fulvo, antennis basi fulvis, thorace vittis quatuor subauratis, scutelli margine fulvo, ventre piceo basi testaceo, pedibus fulvis nigro fasciatis; alis subcinereis, venis stigmatæque nigris, halteribus testaceis.

Female. Black, ferruginous beneath. Head, antennæ at the base, border of the scutellum, and legs tawny; antennæ a little shorter than the breadth of the head; thorax with four slightly gilded

stripes; abdomen beneath piceous, testaceous at the base; femora and tibiæ with broad black bands; wings greyish, stigma and veins black; halteres testaceous. Length of the body 4 lines; of the wings $7\frac{1}{2}$ lines.

11. *STRATIOMYS NEXURA*, n. s. *Mas et Fœm.* Nigra, antennis basi fulvis, capite transverso brevioribus, abdominis lateribus, ventre, tibiis, tarsis halteribusque fulvis, alis limpidis, venis testaceis. *Mas.* Thorace atro piloso. *Fœm.* Thorace nigro-æneo angustiore.

Male and female. Black. Head rather prominent; antennæ tawny towards the base, shorter than the breadth of the head; spines of the scutellum, abdomen beneath, tibiæ, tarsi, and halteres tawny; wings limpid, veins testaceous. *Male.* Thorax deep black, pilose; abdomen tawny along each side. *Female.* Head shining; thorax æneous black, narrower than that of the male; abdomen with the tawny stripes much narrower than those of the male. Length of the body $3\frac{1}{2}$ lines; of the wings $6\frac{1}{2}$ lines.

Gen. *CLITELLARIA*, *Meigen.*

12. *Clitellaria bivittata*, *Fabr.* See Vol. I. p. 7.

Gen. *GABAZA*, n. g.

Fœm. *Corpus* breve, latum. *Caput* transversum, thorace paullo angustius; facies valde obliqua. *Antennæ* capite transverso breviores; articuli breves, transversi; arista longa, gracilis, filiformis. *Scutellum* prominens, spinis duabus minutis. *Abdomen* transversum, thorace multo latius. *Pedes* graciles, breviusculi. *Alæ* sat angustæ; venæ tenues.

Female. Body short, broad. Head transverse, a little narrower than the thorax; face very oblique. Antennæ shorter than the breadth of the head; joints short, transverse; arista slender, filiform, longer than the preceding part, which is lanceolate. Scutellum prominent, armed with two minute spines. Abdomen transverse, much broader than the thorax. Legs slender, somewhat short. Wings rather narrow; veins feeble, in structure like those of *Stratiomys*.

13. *GABAZA ARGENTEA*, n. s. *Fœm.* Nigra, antennis fulvis, arista alba, thorace abdomineque argenteo-tomentosis, tarsis albido-testaceis, alis limpidis, venis pallidis.

Female. Coal-black. Antennæ tawny, arista white; thorax and abdomen with bright silvery tomentum; tarsi whitish testaceous; wings limpid, veins pale. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Gen. *SARGUS*, *Fabr.*

14. *Sargus metallinus*, *Fabr.* See Vol. I. p. 110.

15. *SARGUS COMPLENS*, n. s. *Fæm.* Rufescente-fulvus, capitis vertice nigro, antennis testaceis, abdomine fasciis latis abbreviatis piceis, tarsis posticis basi tibiisque posticis nigris, alis cinereis, basi sub-luridis, apud costam anteriorem nigro-fuscis.

Female. Reddish tawny. Head black above, testaceous beneath; antennæ testaceous; abdomen with four broad abbreviated piceous bands; legs tawny, hind tibiæ black with a tawny apical mark, hind tarsi black towards the base; wings greyish, slightly lurid towards the base, blackish-brown about the exterior part of the costa, veins black, tawny towards the base; halteres testaceous, tawny towards the tips. Length of the body 6 lines; of the wings 14 lines.

16. *SARGUS ROGANS*, n. s. *Mas et Fæm.* Capitis vertice nigro, antennis pedibusque testaceis, tibiis tarsisque posticis nigris, alis sub-cinereis apice obscurioribus. *Mas.* Luteo-testaceus. *Fæm.* Ferrugineus.

Male and Female. Head black above; antennæ and legs testaceous; hind tibiæ and hind tarsi black; wings greyish, darker towards their tips; veins black, tawny towards the base. *Male.* Lutescent testaceous. *Female.* Ferruginous; wings darker than those of the male. Length of the body 5 lines; of the wings 10 lines.

Gen. *NERUA*, n. g.

Fæm. Corpus longiusculum, sublineare. Caput transversum, thorace non latius. Antennæ breves; articulus tertius rotundus; arista apicalis, longa, tenuis, setiformis. Thorax productus. Scutellum spinis quatuor longiusculis. Abdomen depressum, sublineare, thorace vix latius, non longius. Pedes graciles, non longi. Alæ angustæ; venæ bene determinatæ.

Female. Body rather long, nearly linear. Head transverse, not broader than the thorax. Antennæ short; third joint round; arista apical, long, slender, setiform. Thorax long. Abdomen flat, thin, nearly linear, hardly broader and not longer than the thorax. Legs slender, not long. Wings narrow; veins distinctly marked, in structure like those of *Clitellaria*.

This genus may be distinguished from *Culcua* by the shape of the abdomen.

17. *NERUA SCENOPINOÏDES*, n. s. *Fæm.* Atra, nitens, antennis fulvis, scutelli spinis pedibusque albis, alis nigrocinereis, postice pallidioribus, venis nigris, halteribus testaceis.

Female. Coal-black, shining; antennæ tawny; thorax slightly tomentose; spines of the scutellum and legs white; wings blackish grey, paler towards the hind border, veins black; halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

Gen. ADRAGA, n. g.

Mas. *Corpus* sublineare. *Caput* thorace non latius. *Oculi* connexi. *Antennæ* brevissimæ; articulus tertius rotundus; arista apicalis, gracilis, setiformis. *Thorax* sutura transversa bene determinata. *Scutellum* prominens, trigonum, marginatum. *Abdomen* thorace paullo brevius, non latius. *Pedes* breviusculi, validi, non dilatati. *Alæ* mediocres.

Male. Body nearly linear, rather thick. Head not broader than the thorax. Eyes connected. *Antennæ* very short; third joint round; arista apical, long, slender, setiform. Thorax with the transverse suture very distinct. Scutellum prominent, triangular, with a border. Abdomen a little shorter and not broader than the thorax. Legs stout, rather short, not dilated. Wings moderately broad; veins in structure like those of *Clitellaria*.

18. ADRAGA UNIVITTA, n. s. *Mas.* Nigra, subtilissime punctata, antennis piceis, thorace vitta cinerea, tarsis posterioribus albis, alis nigricantibus.

Male. Coal-black, hardly shining; antennæ piceous; thorax and abdomen very minutely punctured; thorax with a stripe of cinereous tomentum; posterior tarsi white; wings blackish, veins black. Length of the body 3 lines; of the wings 5 lines.

Gen. OBRAPA, n. g.

Fæm. *Corpus* breve, latum, crassum, convexum. *Caput* transversum, thorace angustius. *Antennæ* breves; articulus tertius rotundus; arista apicalis, gracilis, setiformis. *Thorax* sutura transversa bene determinata. *Abdomen* transversum, thorace paullo latius, valde brevius. *Pedes* breviusculi, validi; antici subdilatati. *Alæ* mediocres.

Female. Body short, broad, thick, convex. Head transverse, narrower than the thorax. *Antennæ* short; third joint round; arista apical, slender, setiform. Thorax with the transverse suture very distinct. Scutellum large, prominent, with a marginal suture. Abdomen transverse, a little broader than the thorax, and not more than half its length. Legs stout, rather short, the fore pair slightly dilated. Wings moderately broad, veins rather irregular; discal areolet large, quadrilateral; externomedial veins, subanal vein, and anal vein very slight; subanal vein and anal vein united at some distance from the border.

19. OBRAPA PERILAMPOIDES, n. s. *Fæm.* Atræ, nitens, subtilissime punctata, capite glabro, antennis piceis, tarsis posterioribus albidis, alis limpidis, venis albidis basi nigris, halteribus niveis.

Female. Deep black, shining, very minutely punctured; head smooth; antennæ piceous; posterior tarsi whitish, with black tips; wings limpid, veins whitish, black towards the base; halteres snow-white. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

20. *OBRAPA CELYPHOIDES*, n. s. *Fæm.* Atra, nitens, subtilissime punctata, capite glabro, antennis piceis, tarsis albidis, alis nigro-cinereis, venis nigris, halteribus niveis.

Female. Deep black, very minutely punctured. Head smooth; antennæ piceous; tarsi whitish; wings blackish cinereous, veins black; halteres snow-white. Length of the body 2 lines; of the wings 4 lines.

Fam. *TABANIDÆ*, *Leach.*

Gen. *TABANUS*, *Linn.*

21. *TABANUS RECUSANS*, n. s. *Fæm.* Piceus, cinereo-subtomentosus, callo nigro angusto, antennis rufis apice nigris, humeris rufescentibus, abdomine basi glaucescente, tibiis obscure ferrugineis, alis nigro-fuscis, apice margineque postico cinereis.

Female. Piceous, slightly covered with cinereous tomentum. Callus of the head black, long, slender, entire; antennæ red, black towards the tips, angle of the third joint very small; thorax reddish on each side in front of the forewings; abdomen with glaucous tomentum towards the base; tibiæ mostly dark ferruginous; wings blackish-brown, cinereous towards the tips and along the hind border; veins black; forebranch of the cubital vein simple, very slightly undulating, its tip, like that of the radial vein, clouded with blackish-brown. Length of the body $6\frac{1}{2}$ lines; of the wings 12 lines.

Fam. *ASILIDÆ*, *Leach.*

Subfam. *DASYPOGONITES*, *Walk.*

Gen. *DASYPOGON*, *Fabr.*

22. *DASYPOGON INOPINUS*, n. s. *Fæm.* Piceus, facie aurata, mystace parvo albo, antennis ferrugineis, apices versus nigris, capite transverso longioribus, articulo tertio lineari, pectore fasciis tribus canis, abdominis segmentis ferrugineo fasciatis, alis luridis, apud costam nigro-fuscis, halteribus testaceis.

Female. Piceous. Face flat, brightly gilded; epistoma not prominent; mystax with a few white bristles; mouth black; antennæ ferruginous, black towards the tips, longer than the breadth of the head; third joint linear, longer than the first and the second together; pectus with three hoary bands; abdomen subclavate, nearly twice the length of the thorax; a ferruginous band on the hind border of each segment; legs mostly ferruginous; wings lurid, blackish-brown towards the costa, veins black; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

23. *DASYPOGON HONESTUS*, n. s. Lutescente-fulvus, capite, antennis, pedibus alisque nigris, thorace vitta schistacea nigro marginata vit-

tisque duabus lateralibus cinereis, pectore postico nigro, abdomine —?, tibiis tarsisque posticis fulvis.

Luteous-tawny. Head, antennæ, hind part of the pectus, and legs black, shining; mystax with very few bristles; antennæ almost as long as the breadth of the head, third joint long, slender, linear; thorax with a slate-coloured blackish-bordered stripe, a short slate-coloured stripe on each side; abdomen wanting; hind tibiæ and tarsi tawny; wings blackish, veins black. Length of the body 4? lines; of the wings 7 lines.

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

24. *Laphria scapularis*, *Wied. Auss. Zweifl.* 1. 516. 29.

Inhabits also Java.

25. *Laphria aurifacies*, *Macq.* See Vol. I. p. 10.

26. LAPHRIA GLORIOSA, n. s. *Mas et Fæm.* Aurata, capite pectoreque albis, abdomine purpureo, guttis lateralibus albis, basi viridi, lateribus pedibusque cyaneis, alis fuscis basi cinereis, halteribus testaceis.

Male and Female. Head and pectus with white tomentum and hairs; mystax with a few black bristles; mouth and antennæ black; third joint of the latter linear, conical at the tip, longer than the first and the second together; thorax with cupreous-gilded tomentum; abdomen purple, green at the base, blue and with a row of white dots along each side; legs blue; wings brown, cinereous towards the base, veins black; halteres testaceous. *Male.* Legs very thick and pilose. Length of the body 9 lines; of the wings 16 lines.

27. LAPHRIA SOCIA, n. s. *Fæm.* Cyaneo-viridis, capite aurato, antennarum articulo tertio longissimo subfusiformi, thoracis tomento subaurato, vitta media nuda, pectore argenteo, abdomine purpureo-cyaneo basi viridi maculis lateralibus argenteis, alis nigro-cinereis basi cinereis.

Female. Bluish-green. Head brightly gilded, hind part silvery; mystax with six long black bristles; third joint of the antennæ very elongate subfusiform; thorax with slightly gilded tomentum, excepting a broad bare middle stripe; pectus with silvery tomentum; abdomen purplish-blue, green towards the base, with spots of silvery tomentum along each side; hind borders of the ventral segments white; wings grey, blackish-grey for almost half the length from the tips and along three-fourths of the length of the hind border, veins black; halteres ferruginous. Length of the body $8\frac{1}{2}$ lines; of the wings 16 lines.

28. LAPHRIA CONSOBRINA, n. s. *Fæm.* Purpurea, capite aurato, pectore argenteo, abdomine viridi-cyaneo, maculis lateralibus argenteis, alis nigricantibus basi cinereis.

Female. Purple. Head brightly gilded, hind part silvery, underside with white hairs; mystax with six long black bristles; pectus with silvery tomentum; abdomen greenish blue, with spots of silvery tomentum along each side; hind borders of the ventral segments white; wings slightly grey, blackish for full half the length from the tips and along full three-fourths of the length of the hind border, veins black; halteres ferruginous, with black tips. Length of the body $7\frac{1}{2}$ lines; of the wings 14 lines.

This species much resembles *L. socia*, but may be distinguished by the difference of colour, and more especially by the more undulating first branch vein, by the much less oblique third externo-medial vein, and by the subanal vein, which is united to the anal vein much nearer the border.

29. *LAPHRIA SODALIS*, n. s. *Mas.* Cyanea, capite aurato, antennarum articulo tertio fusiformi, thoracis lateribus purpureo-viridibus, pectore ventrequae argenteis, abdomine maculis lateralibus argenteis, alis cinereis, apice posticeque nigricantibus.

Male. Blue. Head brightly gilded, vertex and hind part silvery, underside with white hairs; mystax with four long black bristles, and with several gilded bristles; third joint of the antennæ elongate-fusiform; sides of the thorax varied with green and purple; abdomen with spots of silvery tomentum along each side, underside and pectus silvery; wings grey, black towards the tips and along half the length of the hind border; halteres white. Length of the body 7 lines; of the wings 13 lines.

The veins of this species are hardly different from those of *L. consobrina* in structure, excepting the third externo-medial, which is united to the fourth nearer the border.

30. *LAPHRIA COMES*, n. s. *Mas et Fæm.* Viridi-cyanea, capite aurato, antennarum articulo tertio fusiformi, pectore ventrisque lateribus argenteis, abdomine viridi (mas) aut purpureo-cyaneo (fæm.) maculis lateralibus argenteis, alis nigricantibus basi cinereis.

Male and Female. Greenish blue. Head brightly gilded, hind part silvery; mystax with six long black bristles; third joint of the antennæ elongate-fusiform; pectus with silvery tomentum; abdomen green in the male, purplish-blue in the female, with silvery spots along each side, underside with two silvery stripes; wings blackish, grey at the base and along the costa for more than one-third of the length, veins and halteres black. Length of the body $6-6\frac{1}{2}$ lines; of the wings 11-12 lines.

This may be only a small variety of *L. consobrina*; but the wings are not darker towards the costa as in that species, and the first branch-vein is much more straight.

31. *LAPHRIA CONSORS*, n. s. *Mas et Fæm.* Viridis (mas) aut cyanea (fæm.), capite aurato, antennarum articulo tertio brevifusiformi, pectore

argenteo, abdomine æneo-viridi (mas) aut cyaneo-purpureo (fœm.) maculis lateralibus argenteis, alis nigricantibus, basi cinereis.

Male and Female. Green (male) or blue (female). Head gilded, hind part silvery; mystax with a few black bristles; third joint of the antennæ short-fusiform; pectus silvery; abdomen æneous-green in the male, bluish-purple in the female, with silvery spots along each side; wings blackish, grey at the base and along the costa for more than one-third of the length; veins and halteres black. Length of the body $4\frac{1}{2}$ –5 lines; of the wings 8–9 lines.

The straight and not oblique third externo-medial vein distinguishes this species from all the preceding *Laphriæ*.

32. *LAPHRIA GERMANA*, n. s. *Fœm.* Cyanea, facie aurata, antennarum articulo tertio longissime subfusiformi, abdominis maculis lateralibus pectoreque argenteis, alis cinereis, basi subcinereis, halteribus albis.

Female. Blue. Head gilded in front, vertex and hind part silvery; mystax with six black bristles; third joint of the antennæ very long, subfusiform; pectus silvery; abdomen purplish blue, shorter than in the preceding species, with silvery spots along each side; wings grey, slightly grey towards the base; halteres white. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

33. *LAPHRIA FLAGRANTISSIMA*, n. s. *Mas.* Rufescence-cervina, capite aurato, antennis pedibusque rufescentibus, thorace vittis tribus latissimis (lateralibus abbreviatis) pectoreque nigricantibus, alis lutescentibus, plaga postica interiore fasciæque latissima exteriore nigricantibus.

Male. Reddish fawn colour. Head gilded; mystax with numerous gilded bristles; mouth lanceolate, very stout; antennæ reddish, third joint long, lanceolate, abruptly acuminate at the tip; thorax with three very broad blackish stripes; disk of the pectus black; abdomen with the segments darker towards the base, underside black towards the tip; legs reddish, stout; tarsi with black bands beneath; wings somewhat luteous, with a large blackish patch on the hind border near the base, and with a very broad blackish band near the tip; halteres testaceous. Length of the body 11 lines; of the wings 22 lines.

34. *LAPHRIA JUSTA*, n. s. *Mas.* Lutea, capite aurato, ore, antennis apice, thoracis maculis duabus posticis, pectore, abdominis fasciis latis femoribusque nigris, alis cinereis, apud costam luridis.

Male. Luteous. Head gilded; mystax with numerous gilded bristles; mouth short, black; antennæ reddish tawny, third joint lanceolate, black except at the base; thorax with the disk somewhat darker, two large black spots hindward; pectus black; abdomen linear, with a broad black band on the fore border of each segment; femora black above except at the tips, hind femora black also beneath; wings

greyish, slightly clouded with dark grey, lurid along the costa for three-fourths of the length; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

35. *LAPHRIA MANIFESTA*, n. s. *Mas et Fœm.* Fulva, capite argenteo (mas) aut pallide aurato (fœm.), antennis apice nigris, thoracis disco et abdominis maculis subtrigonis subæneo-ferrugineis, scutello quadrisetosus, alis subcinereis.

Male and Female. Tawny. Head silvery in the male, pale-gilded in the female; mystax with several slender bristles; mouth lanceolate; third joint of the antennæ very elongate-subfusiform, black towards the tip; disk of the thorax and nearly triangular dorsal spots of the abdomen ferruginous with a slight æneous tinge; pectus testaceous, slightly silvery; wings slightly greyish; veins black, testaceous at the base, where the wings also have a testaceous tinge; halteres testaceous. Length of the body $4\frac{1}{2}$ –5 lines; of the wings 8–9 lines.

36. *LAPHRIA APERTA*, n. s. *Fœm.* Testacea, capite subargenteo, antennis abdominisque apice nigris, alis nigricantibus basi limpidis, halteribus albidis.

Female. Testaceous. Head with whitish slightly silvery tomentum; mystax with very few bristles; antennæ black, third joint long, linear, conical at the tip; thorax with a very indistinct darker stripe; abdomen black towards the tip; wings blackish, limpid towards the base; veins black, testaceous at the base; halteres whitish. Length of the body 4 lines; of the wings 7 lines.

37. *LAPHRIA DECLARATA*, n. s. *Mas.* Fulva, capite albo, facie argentea micante, antennis tibiisque posticis nigris, thorace atro, alis cinereis, venis nigris, halteribus testaceis.

Male. Tawny, slender. Head white, face brilliant silvery; mystax with four bristles; mouth black, short, slender; eyes flat in front; antennæ black, almost as long as the breadth of the head; third joint long, slender, lanceolate; thorax deep black; scutellum reddish tawny; hind tibiæ black, with tawny tips; wings greyish, veins black; discal veinlet and third externomedial vein forming one straight line, as in the genus *Atomosia*; halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Subfam. ASILITES, *Walk.*

Gen. *TRUPANEA*, *Macq.*

38. *TRUPANEA CONTRADICENS*, n. s. *Mas et Fœm.* Nigricans, cinereo-subtomentosa, thoracis vittis pectoreque cano-tomentosis, pedibus nigris, tibiis rufis apice nigris, alis fusco-cinereis, areola radiali schistaceo vittata. *Mas.* Capite subaurato, barba testaceo-albida, abdominis segmentis lutescente marginatis. *Fœm.* Capite barbaque albidis, abdomine stylato, segmentis cano marginatis.

Male and Female. Blackish. Antennæ and legs black; thorax slightly

covered with cinereous tomentum ; stripes, pectus, and underside of the abdomen hoary ; tibiæ red, with black tips ; wings brownish grey ; radial areolet with a slate-coloured stripe. *Male*. Head slightly gilded ; mystax with a few black bristles and many gilded bristles ; beard testaceous-whitish ; sides of the abdomen and hind borders of the segments lutescent. *Female*. Head and beard whitish ; mystax with many black bristles and a few white bristles ; abdomen with an apical style, more than one-third of the length of the preceding part, sides and hind borders of the segments hoary. Length of the body 12-14 lines ; of the wings 14-18 lines.

Gen. *ASILUS*, *Linn.*

39. *Asilus longistylus*, *Wied. Auss. Zweifl.* 1. 433. 13.

Inhabits also Java.

Gen. *OMMATIUS*, *Illiger.*

40. *OMMATIUS NOCTIFER*, n. s. *Mas.* Niger, capite aurato, thoracis incisuris, scutello, pectore, segmentorum abdominalium marginibus ventrequè canis, tibiis fulvis apice nigris, alis cinereis costa apiceque nigricantibus, halteribus ferrugineis.

Male. Black. Head gilded ; mystax with a few black and several gilded bristles ; sutures of the thorax, scutellum, sides, pectus, hind borders of the abdominal segments, and underside hoary ; tibiæ tawny, with black tips ; wings cinereous, blackish along the costa and towards the tips, veins black ; halteres ferruginous. Length of the body 6-6½ lines ; of the wings 11-12 lines.

41. *OMMATIUS LUCIFER*, n. s. *Mas.* Aeneo-niger, capite argenteo, pectore albido, abdominis segmentis ferrugineo marginatis, pedibus testaceis, femoribus nigro-vittatis, tarsis nigris, alis limpidis apice nigricantibus costa atra apud medium inerassata, halteribus testaceis.

Male. Bronze-black. Head silvery in front ; mystax with a few black and a few whitish bristles ; pectus whitish ; hind borders of the abdominal segments ferruginous ; legs testaceous ; femora striped with black ; tarsi black, ferruginous at the base ; wings limpid, blackish at the tips ; costa deep black, inerassated in the middle ; halteres testaceous. Length of the body 6 lines ; of the wings 11 lines.

42. *OMMATIUS RETRAHIENS*, n. s. *Fam.* Cinereo-niger, facie argentea, pectore albido, pedibus testaceis, tarsis, femoribus tibiisque apice femoribusque posticis nigris, alis limpidis apice subcinereis, halteribus testaceis.

Female. Cinereous-black. Head silvery white in front ; mystax with very few white and black bristles ; pectus whitish ; legs testaceous ; tips of the anterior femora and of the middle tibiæ black ; hind femora and hind tarsi black ; anterior tarsi and hind tibiæ black, testaceous towards the base ; wings limpid, slightly cinereous towards the tips ;

veins black; halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

Gen. *LEPTOGASTER*, *Meigen*.

43. *LEPTOGASTER FERRUGINEUS*, n. s. *Mas*. Ferrugineus, pectore albo, abdomine nigro, segmentorum marginibus ventrequé testaceis, pedibus fulvis, femoribus apice nigris, tibiis piceo vittatis, tibiis posticis tarsisque nigris basi testaceis, alis sublimpidis, halteribus testaceis apice piceis.

Male. Ferruginous. Head pale, gilded in front, hind side and pectus white; mouth and antennæ tawny, the latter blackish towards the tips; abdomen black; hind borders of the segments and under side testaceous; legs tawny; anterior femora with a testaceous band before the tips, which are black; hind femora and anterior tibiæ striped with piceous, the latter black towards the tips; tarsi and hind tibiæ black, testaceous at the base; wings very slightly greyish, veins black; halteres testaceous, piceous towards the tips. Length of the body 7 lines; of the wings 10 lines.

44. *LEPTOGASTER LONGIPES*, n. s. *Mas*. Ferrugineus, pectore alido, abdomine piceo, segmentis apice fulvescentibus, pedibus anterioribus fulvescentibus, posticis piceis longissimis, femoribus posticis basi testaceis, alis subcinereis basi obscurioribus costa venisque nigris, halteribus testaceis apice nigris.

Male. Ferruginous. Head testaceous in front; mouth and antennæ black; pectus whitish; abdomen piceous, hind borders of the segments somewhat tawny; legs somewhat tawny; hind legs piceous, very long, their femora testaceous at the base; wings slightly greyish, darker towards the base, costa and veins black; halteres testaceous, with black knobs. Length of the body 4 lines; of the wings 8 lines.

45. *LEPTOGASTER ALBIMANUS*, n. s. *Mas*. Niger, capite antico pectoreque albis, antennis basi ferrugineis, abdominis segmentis cano fasciatis, femoribus, tibiis tarsisque basi albis, femoribus posticis luteo fasciatis, alis limpidis, halteribus albidis apice piceis.

Male. Black. Head in front and the pectus white; antennæ ferruginous at the base; abdomen long, a hoary band on the hind border of each segment; femora, tibiæ, and tarsi white at the base; hind legs long, rather stout; hind femora with a luteous band; wings limpid, veins black; halteres whitish, with piceous knobs. Length of the body 5 lines; of the wings 7 lines.

Fam. *LEPTIDÆ*, *Westw*.

Gen. *LEPTIS*, *Fabr*.

46. *Leptis ferruginosa*, *Wied*. See Vol. I. p. 118.

Gen. *CHRY SOPILA*, *Macq*.

47. *CHRY SOPILA VACILLANS*, n. s. *Mas et Fem*. Lutescens, capite

nigro, thorace subvittato, abdominis segmentis nigro fasciatis, alis sublimpidis apud costam flavescentibus, venis fusco latissime marginatis, stigmatе nigro-fusco.

Male and Female. Lutescent. Head of the female black, shining; thorax with two brown bands which are paler and indistinct hindward; abdomen with a broad black band on each segment; tarsi blackish towards the tips; wings nearly limpid, yellowish along the costa, veins exteriorly with very broad brownish borders, stigma blackish brown. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Fam. BOMBYLIDÆ, *Leach.*

Subfam. THEREVITES, *Walk.*

48. THEREVA CONGRUA, n. s. *Mas.* Nigra, glaucescente albo tomentosa, albo pilosa, capite argenteo, thorace trivittato et bilineato, pedibus nigris, femoribus albis, alis cinereis stigmatе elongato venisque nigris.

Male. Black, with glaucous-white tomentum and with white hairs. Head silvery in front; thorax with three blackish brown stripes, the middle one with a dark stripe on each side, broader and more distinct than the lateral pair; abdomen beneath and legs black, femora white; wings grey, with an elongated black stigma and black veins; halteres black. Length of the body 5 lines; of the wings 8 lines.

Subfam. BOMBYLITES, *Walk.*

Gen. ANTHRAX, *Fabr.*

49. ANTHRAX PELOPS, n. s. *Mas.* Ferruginea, thoracis margine rufo piloso, pectore abdomineque nigris, abdomine fasciis duabus, maculis duabus apicalibus, plagaque ventrali subtrigona argenteis, alis cinereis, basi costaque nigris.

Male. Closely allied to *A. Tantalus*. Dark ferruginous. Head above, antennæ, pectus, abdomen, and legs black; thorax bordered with red hairs; pectus with a silvery dot on each side; abdomen with red hairs on each side at the base, with two silvery bands, with two silvery apical spots, and with a ventral, nearly triangular, silvery patch; wings cinereous, black at the base and along five-sixths of the length of the costa, veins and halteres black. Length of the body 8 lines; of the wings 18 lines.

50. Anthrax semiscita, *Walk.* See Vol. I. p. 118.

51. Anthrax degenera, *Walk.* See Vol. I. p. 15.

Gen. GERON, *Meigen.*

52. GERON SIMPLEX, n. s. *Mas.* Ater, antennis pedibusque nigris, alis subcinereis, halteribus fulvis.

Male. Deep black. Eyes bright red; proboscis a little longer than the thorax; antennæ and legs black; wings slightly greyish, veins black; halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Fam. EMPIDOÆ, *Leach.*

Gen. HYBOS, *Fabr.*

53. HYBOS BICOLOR, n. s. *Mas.* Fulvus, ore antennisque testaceis, abdomine, femoribus posticis apice tibiisque anticis piceis, tarsis anterioribus ferrugineis, alis obscure cinereis.

Male. Tawny. Mouth and antennæ testaceous; abdomen, hind femora at the tips, and fore tibiæ piceous, anterior tarsi ferruginous; wings dark grey, veins black. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Fam. DOLICHOPIDÆ, *Leach.*

Gen. PSILOPUS, *Meigen.*

54. Psilopus æneus, *Fabr. Syst. Antl.* 268. 9.

Inhabits also Java.

55. PSILOPUS BENEDICTUS, n. s. *Mas et Fæm.* Aureo-viridis, facie pectoreque argenteis, antennis testaceis apice nigris, thorace vittis tribus cupreis, abdomine fasciis cupreo-purpureis, maculis lateralibus albidis, pedibus testaceis tibiis posticis tarsisque nigris, alis subcinereis, costam versus et apud venas transversas nigrofuscis, halteribus testaceis. *Fæm.* Vertice cyaneo-purpureo, abdomine fasciis cyaneis.

Male and Female. Golden green. Face silvery; antennæ testaceous, black towards the tips, arista full as long as the thorax; thorax with three cupreous stripes; pectus silvery; abdomen with cupreous purple bands and with whitish spots along each side; legs testaceous, tarsi and hind tibiæ black; wings slightly greyish, blackish brown along the costa and about the transverse veins, veins black, fore branch of the præbrachial vein curved inward, discal transverse vein undulating; halteres testaceous. *Female.* Vertex bluish purple; abdomen with blue bands. Length of the body 4-4½ lines; of the wings 7-8 lines.

56. PSILOPUS LUCIGENA, n. s. *Mas.* Aureo-viridis, facie pectoreque argenteis, antennis tarsisque nigris, thorace vittis tribus rufo-cupreis, abdomine fasciis cupreo-purpureis, femoribus lutescentibus, tibiis piceis, femoribus anticis apice nigricantibus, alis nigris apice albis, halteribus fulvis apice nigris.

Male. Golden green. Face and pectus silvery; antennæ black, arista longer than the thorax; thorax with three broad reddish cupreous stripes; abdomen with broad cupreous purple bands; femora lutescent, tibiæ piceous, fore femora blackish towards the tips, tarsi

black; wings black, tips snow-white, fore branch of the præbrachial vein slightly curved inward, discal transverse vein much curved outward; halteres tawny, with black tips. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

57. *PSILOPUS flavicornis*, Wied. *Auss. Zweifl.* 11. 227. 31.

Inhabits also Sumatra.

58. *PSILOPUS TERMINIFER*, n. s. *Mas.* Aureo-viridis, vertice cyaneo-purpureo, facie pectoreque argenteis, antennis, pedibus halteribusque testaceis, abdomine apicem versus atro fasciis duabus cupreis, alis subcinereis apice nigris.

Male. Golden-green, slender. Vertex bluish-purple; face and pectus silvery; antennæ testaceous, arista about half the length of the body; fourth and fifth segments of the abdomen deep black with a cupreous band on the hind border of each segment, tip blue; legs and halteres testaceous; wings greyish, paler along the hind border, tips black, fore branch of the præbrachial vein slightly curved inward, discal transverse vein slightly undulating. Length of the body 3 lines; of the wings 5 lines.

59. *PSILOPUS ORCIFER*, n. s. *Fæm.* Purpureus, facie pectoreque subcinereis, antennis, pedibus halteribusque nigris, abdomine cyaneo-viridi segmentorum marginibus posticis purpureis, alis nigricantibus margine postico cinereo. *Var.* Viridis, vertice cyaneo, abdominis segmentis basi nigris.

Female. Purple, rather stout. Face and pectus slightly cinereous; antennæ, legs, and halteres black; abdomen bluish-green, hind borders of the segments purple; wings blackish, cinereous along the hind border, fore branch of the præbrachial vein forming an obtuse angle, discal transverse vein very undulating. *Var.* Green. Vertex blue; abdominal segments black at the base. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

60. *PSILOPUS EGENS*, n. s. *Mas et Fæm.* Purpureus, facie pectoreque cyaneo-viridi cinereo subtomentosis, antennis, pedibus halteribusque nigris, metathorace viridi, abdomine cyaneo, suturis nigris, alis cinereis.

Male and Female. Purple. Face and pectus slightly covered with cinereous tomentum, the latter bluish-green; antennæ black, arista much more than half the length of the body; metathorax green; abdomen blue, sutures black; legs and halteres black; wings grey, fore branch of the præbrachial vein much curved inward, discal transverse vein straight; length of the body $2\frac{1}{2}$ – $2\frac{3}{4}$ lines; of the wings 5 lines.

Gen. DOLICHOPUS, *Latr.*

61. *DOLICHOPUS TRIGONIFER*, n. s. *Fæm.* Cupreo-viridis, facie argentea, antennis, pedibus halteribusque testaceis, pectore, ventre ab-

dominisque maculis lateralibus trigonis albidis, abdomine purpureo marginibus posticis nigris, tarsis posterioribus nigricantibus, alis cinereis.

Female. Cupreous green. Face silvery; antennæ, legs, and halteres testaceous; pectus, abdomen beneath, and triangular spots on each side whitish; abdomen purple, hind borders of the segments black; posterior tarsi blackish; wings grey, veins black, præbrachial vein forming a right angle at its flexure, between which and the border it is much curved inward, discal transverse vein very slightly curved outwards. Length of the body 3 lines; of the wings 5 lines.

This species resembles the *Psilopi* in the structure of the præbrachial vein.

Gen. DIAPHORUS, *Meigen*.

62. DIAPHORUS RESUMENS, n. s. *Mas et Fæm.* Obscure viridis (mas) aut niger (fœm.), facie pectoreque albidis, antennis piceis, abdomine nigro-cupreo basi obscure testaceo, pedibus anterioribus tibiisque posticis basi obscure testaceis, pedibus posticis nigris, alis nigricantibus apud marginem posticum pallidioribus, halteribus testaceis.

Male and Female. Dark green (male) or black (female). Face and pectus whitish; antennæ piceous; abdomen cupreous-black, dull testaceous towards the base; hind legs black, hind tibiæ towards the base and anterior legs dull testaceous; wings blackish, paler along the hind border, veins black, præbrachial vein and discal transverse vein straight; halteres testaceous. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Fam. SYRPHIDÆ, *Leach*.

Gen. CERIA, *Fabr.*

63. CERIA SMARAGDINA, n. s. *Fæm.* Saturate metallico-viridis, subtilissime punctata, faciei lateribus cupreis, antennis nigris, arista nivea, thorace bivittato, abdomine æneo-viridi, tarsis nigris, alis dimidio costali nigro, halteribus testaceis.

Female. Deep metallic green, very finely punctured. Head blue in front, sides of the face cupreous-purple; mouth, antennæ, and tarsi black; arista snow-white; thorax with two almost contiguous darker stripes; abdomen æneous green, with the exception of the petiole, which is very thick; wings slightly greyish, costal half black; halteres testaceous. Length of the body 7 lines; of the wings 14 lines.

64. CERIA RELICTA, n. s. *Mas.* Nigra, faciei lateribus, thoracis maculis quatuor humeralibus, pectoris fasciis duabus lateralibus, scutello, abdominis maculis duabus basalibus fasciisque duabus flavis, tibiis flavescentibus apice piceis, alis apud costam nigris, halteribus testaceis.

Male. Black. Head yellow beneath, and in front with the exception of a black stripe on the disk of the face; arista white; thorax with

two yellow spots on each side in front; scutellum yellow; pectus with an oblique yellow band on each side; abdomen not petiolated, with a tumid yellow spot on each side at the base, hind borders of the third and fourth segments yellow; femora at the tips and tibiae yellow, the latter piceous towards the tips, tarsi piceous; wings greyish-black towards the costa, excepting a lurid costal streak which extends along half the length from the base; halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

65. *CERIA RELICTA*, n. s. *Fœm.* Nigra, faciei lateribus abdominisque fasciis duabus flavis, antennis ferrugineo variis, pedibus fulvis, alis cinereis costam versus nigris, halteribus stramineis.

Female. Black. Head yellow, beneath and in front with the exception of a black stripe on the disk of the face; first and third joints of the antennæ somewhat ferruginous, arista white; thorax with two indistinct yellowish marks on the transverse suture, hind border of the scutellum and hind borders of the second and third abdominal segments yellow; legs tawny, tibiae paler towards the base; wings green, black for nearly half the breadth from the costa; halteres straw-colour. Length of the body 6 lines; of the wings 11 lines.

This may prove to be the female of *C. relictura*, notwithstanding its great difference from that species in the marks of the thorax and of the abdomen, and in the colour of the legs.

Gen. MICRODON, *Meig.*

66. *MICRODON FULVICORNIS*, n. s. *Mas.* Niger, aureo-subpubescens, antennis, abdomine, pedibus halteribusque fulvis, femoribus nigris, tibiis nigro vittatis, alis fuscis postice cinereis.

Male. Black. Head with gilded pubescence, cinereous behind and beneath; antennæ tawny, second joint above towards the tip and third joint piceous; thorax slightly covered with gilded tomentum; pectus with cinereous tomentum; abdomen with gilded tomentum towards the tip; legs tawny, femora mostly black, tibiae with black stripes; wings cinereous, dark-brown about the costa, veinlet which bisects the subapical areolet incomplete, as it is also in the following species; halteres tawny. Length of the body 6 lines; of the wings 12 lines.

67. *MICRODON APICALIS*, n. s. *Mas et Fœm.* Niger, aureo-pubescens, thorace abdomineque fasciatis, pedibus halteribusque fulvis, alis nigro-fuscis postice obscure cinereis.

Male and Female. Black, with gilded tomentum, which forms two bands on the thorax, and one on each side of the pectus; abdomen with three gilded tomentose bands, the third subapical, first segment ferruginous beneath; legs tawny, femora at the base and coxæ black; wings blackish-brown, dark cinereous hindward; halteres tawny. Length of the body 5-6 lines; of the wings 10-12 lines.

Gen. GRAPTOMYZA, *Wied.*

68. GRAPTOMYZA TIBIALIS, n. s. *Mas*. Testacea, vertice pectorisque fasciis duabus piceis, antennis supra nigris, abdominis lateribus fasciis duabus subtrigonis apiceque nigris, alis cinereis.

Male. Testaceous. Vertex and mouth piceous; epistoma with a piceous line on each side; third joint of the antennæ black above; abdomen black along each side and at the tip, and with two black bands which are angular in front; wings cinereous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. ERISTALIS, *Latr.*

69. Eristalis splendens, *Leguillon, Voy. aut. du Monde; Macq. Dipt. Exot.* 11. 2. 49. 28.

Inhabits also Solomon's Islands.

70. ERISTALIS RESOLUTUS, n. s. *Mas et Fæm.* Niger, capite antice albo, thorace vittis duabus fasciaque pectorisque disco cinereis, scutello fulvo, abdomine fasciis interruptis æneo-viridibus, tibiis basi fulvescentibus, alis fuscis (mas) aut obscure fuscis (fæm.) basi cinereis, halteribus testaceis.

Male and Female. Black. Head shining, with white tomentum beneath and on each side of the face; third joint of the antennæ piceous, arista simple; thorax with two cinereous stripes and with one cinereous band, somewhat chalybeous towards the scutellum, which is tawny; the band continued on each side of the pectus, whose disk is cinereous; abdomen with an interrupted æneous-green band on the second segment, third and fourth segments æneous-green, each with three large black spots; tibia somewhat tawny towards the base; wings brown (male) or dark brown (female), cinereous towards the base; halteres testaceous. Length of the body 6 lines; of the wings 10 lines.

71. ERISTALIS CONDUCTUS, n. s. *Fæm.* Niger, faciei lateribus albis, antennis, scutello, abdominis fasciis pedibusque testaceis, thorace antico albido, alis subcinereis apice obscurioribus.

Female. Black. Head shining, with white tomentum behind, beneath and on each side of the face; antennæ, scutellum, and legs testaceous, arista simple; thorax whitish in front, the whitish part continued in a short band on each side of the pectus; abdomen testaceous at the base and beneath, and with three testaceous bands; hind tibiae with black tips; wings slightly greyish, darker towards the tips, cubital vein much less bent than usual; halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

72. ERISTALIS SUAVISSIMUS, n. s. *Fæm.* Fulvus, capite testaceo vertice nigro, thorace vittis quinque testaceis, abdomine nigro maculis sex lutescentibus, segmentorum marginibus posticis æneis, pedibus nigris testaceo fasciatis, alis sublimpidis punctis duobus costalibus nigris.

Female. Tawny. Head with testaceous tomentum, vertex black, shining; antennæ testaceous, arista simple; thorax with five testaceous stripes; pectus with two oblique testaceous bands on each side; abdomen black, with six somewhat luteous spots, the basal pair larger and darker than the middle pair, which are larger than the hind pair, apical segment with two testaceous points, hind borders of the segments æneous above, testaceous beneath; legs black, tibiæ at the base and tarsi testaceous; wings nearly limpid, costa with two black points; halteres testaceous. Length of the body $5\frac{1}{2}$ lines; of the wings 10 lines.

73. *ERISTALIS MUSCOIDES*, n. s. *Mas.* Cyaneo-*viridis* subchalybeus, capitis callo antennisque fulvis, faciei lateribus albo tomentosis, thorace subvittato, abdomine nigro maculis æneo-*viridibus*, pedibus nigris, alis subcinereis, halteribus albis.

Male. Bluish-green, with a slight chalybeous tinge. Face with white tomentum along each side, middle callus tawny, shining; antennæ pale tawny, arista plumose; thorax with three indistinct black stripes, the lateral pair oblique, callus on each side beneath pale tawny; abdomen black, second segment with a broad interrupted bluish green band, third segment with four æneous-green streaks, fourth segment also with four streaks which are united on the hind border, ventral segments whitish on each side; legs black; femora bluish black towards the base; wings slightly cinereous; halteres white. Length of the body 4 lines; of the wings 8 lines.

Gen. *HELOPHILUS*, *Meigen*.

74. *Helophilus quadrivittatus*, *Wied. Auss. Zweifl.* 11. 168. 22. (*Eristalis*).

Inhabits also Hindostan.

75. *HELOPHILUS MESOLEUCUS*, n. s. *Fæm.* Niger, faciei lateribus niveo tomentosis, thorace vittis quatuor canis, scutello, abdominis fascia antica latissima interrupta basique lutescentibus, alis cinereis, venis basi halteribusque fulvis.

Female. Black. Face with snow-white tomentum on each side; thorax with four hoary stripes; pectus with a cinereous disk; scutellum pale luteous; abdomen pale luteous at the base, and with a broad interrupted pale luteous band on the second segment, third and fourth segments somewhat chalybeous, the former livid along the fore border, under side with two lateral abbreviated pale luteous stripes; hind femora thick; wings grey, veins towards the base, and halteres, tawny. Length of the body $6\frac{1}{2}$ lines; of the wings 12 lines.

Gen. *XYLOTA*, *Meigen*.

76. *XYLOTA VENTRALIS*, n. s. *Fæm.* Nigro-chalybea, capite albidio tomentoso, scutello fulvo, vittis duabus ventralibus latis abbreviatis

testaccis, pedibus piceo et testaceo variis, alis fuscis basi cinereis, halteribus testaceis.

Female. Blackish chalybeous. Head with whitish tomentum, excepting the callus on the vertex and another on the front; mouth and antennæ black; scutellum tawny; abdomen beneath with two very broad testaceous stripes extending from the base to two-thirds of the length; legs dingy testaceous, femora and hind tibiæ partly piceous, hind femora thick, piceous, slightly chalybeous, armed with spines beneath; wings dark brown, cinereous towards the base; halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. ORTHONEURA, *Macq.*

77. ORTHONEURA BASALIS, n. s. *Fam.* Chalybeo-nigra, nitens, cano-subtomentosa, antennis ferrugineis basi fulvis articulo tertio elongato, tarsis posterioribus piceis, tarsis anticis tibiisque anterioribus fulvis, his nigro fasciatis, alis subcinereis fusco fasciatis, halteribus testaceis.

Female. Chalybeous-black, very shining, partly and slightly covered with hoary tomentum; antennæ tawny, third joint ferruginous, long, linear, tawny at the base; anterior tibiæ tawny with a black band, fore tarsi tawny, hinder tarsi piceous; wings greyish, with a sub-apical brown band which is abbreviated hindward, veins towards the base and halteres testaceous; alulae whitish. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. SYRPHUS, *Fabr.*

78. *Syrphus ægrotus*, *Fabr.* See Vol. I. p. 124.

79. *Syrphus ericetorum*, *Fabr. Ent. Syst.* iv. 287. 34.

Inhabits also Sierra Leone, Hindostan, and Java.

Fam. MUSCIDÆ, *Latr.*

Subfam. TACHINIDES, *Walk.*

Gen. MASICERA, *Macq.*

80. MASICERA NOTABILIS, n. s. *Mas.* Nigra, longiuscula, capite abdominisque fasciis albis, frontalibus atris, pectore cano, scutelli margine postico abdominisque lateribus ferrugineis, alis cinereis, venis fusco marginatis.

Male. Black, rather long, with long stout bristles; head white, silvery, with white hairs behind and beneath, frontalia deep black, widening slightly to the face, facialia without bristles, epistoma not prominent; eyes bare; palpi ferruginous at the tips; antennæ extending to the epistoma, third joint slightly widening towards the tip, nearly four times the length of the second, arista slender, very much longer than the third joint; pectus and sides of the thorax hoary, hind border of the scutellum ferruginous; abdomen fusiform, much longer

than the thorax, with a broad slightly interrupted white band on the fore border of each segment, sides of the second and third segments slightly ferruginous; wings grey, veins black bordered with brown, præbrachial vein forming a slightly acute angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein curved inward, parted by less than its length from the border, and by rather more than half its length from the flexure of the præbrachial; alulae white; halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

81. *MASICERA? TENTATA*, n. s. Nigra, cinereo-tomentosa, capite argenteo-frontalibus atris, antennarum articulo tertio basi rufo, thorace quadrivittato, abdomine?, pedibus longiusculis, alis nigricantibus postice cinereis.

Black, with cinereous tomentum and with moderately stout bristles. Head silvery with white hairs behind and beneath, frontalia deep black, slightly widening towards the face, facialia without bristles, epistoma not prominent; antennae extending nearly to the epistoma; third joint cinereous, slender, linear, red towards the base, rounded at the tip, more than four times the length of the second; arista slender, much longer than the third joint; thorax with four slender black stripes; scutellum not cinereous; abdomen wanting; legs rather long and slender; wings blackish, cinereous hindward and at the tips, veins black, præbrachial vein forming a very obtuse angle at its flexure, from whence it is almost straight to its tip, discal transverse vein slightly undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial; alulae large, yellowish white; halteres piceous. Length of the body 4? lines; of the wings 7 lines.

82. *MASICERA SOLENNIS*, n. s. *Fam.* Nigra, breviusecula, cinereo-tomentosa, capite albo, frontalibus atris, thorace quadrivittato, scutelli margine postico ferrugineo, abdomine subtessellato, alis cinereis.

Female. Black, rather short, with cinereous tomentum. Head white, with white hairs behind and beneath, frontalia deep black, widening towards the face, facialia without bristles, epistoma not prominent; eyes bare; antennae almost reaching the epistoma, third joint cinereous, linear, rounded at the tip, more than four times the length of the second, arista slightly stout towards the base, much longer than the third joint; thorax with four slender black stripes; scutellum ferruginous along the hind border; abdomen short-conical, with three broad interrupted cinereous bands; legs rather short; wings grey, veins black, præbrachial vein forming a slightly obtuse angle at its flexure, from whence it is almost straight to its tip, discal transverse vein nearly straight, parted by much less than its length from the border and by a little less than its length from the flexure of the præbrachial; alulae cinereous. Length of the body 3 lines; of the wings 5 lines.

83. *MASICERA SIMPLEX*, n. s. *Fem.* Nigra, capite albo, frontalibus atris, thorace cinereo-tomentoso quadrivittato, abdomine fasciis cinereis late interruptis, alis cinereis.

Female. Black, with stout bristles. Head white, with white hairs beneath, frontalia deep black, linear, face oblique, facialia without bristles, epistoma not prominent; eyes bare; antennæ almost reaching the epistoma, third joint cinereous, linear, rather broad, almost truncated at the tip, about four times the length of the second, arista slender, very much longer than the third joint; thorax and pectus with cinereous tomentum, the former with four slender black stripes; abdomen shining, subelliptical, a little longer than the thorax, with a widely interrupted cinereous band on the fore border of each segment; legs stout; wings cinereous; veins black; præbrachial vein forming a very obtuse angle at its flexure, from whence it is straight to its tip, discal transverse vein almost straight, parted by hardly less than its length from the border, and by very much more than its length from the flexure of the præbrachial; alulæ white. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

84. *MASICERA GUTTATA*, n. s. *Fem.* Nigra, capite albo, frontalibus atris, thoracis vittis tribus pectoreque cinereis, abdomine guttis lateralibus albis, alis cinereis.

Female. Black, with short slight bristles. Head white, frontalia deep black, widening slightly towards the epistoma, face oblique, facialia without bristles, epistoma not prominent; antennæ reaching the epistoma, third joint linear, slightly truncated at the tip, full four times the length of the second, arista slender; thorax with three cinereous stripes; pectus cinereous; abdomen elongate-oval, a little longer than the thorax, a row of white dots along each side on the fore borders of the segments; wings cinereous, a little darker along the costa towards the base, veins black, præbrachial vein forming a very obtuse angle at its flexure, from whence it is almost straight to its tips; discal transverse vein straight, parted by more than its length from the border and by nearly twice its length from the flexure of the præbrachial; alulæ whitish. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. *EURYGASTER*, *Macq.*

85. *EURYGASTER TENTANS*, n. s. *Fem.* Nigra, latiuscula, cinereo tomentosa, capite albo, frontalibus atris, thorace vittis quatuor nigris, scutelli margine postico ferrugineo, abdomine subtessellato, alis cinereis apud costam subfuscis.

Female. Black, rather broad, with cinereous tomentum. Head white, with white hairs behind and beneath, frontalia deep black, narrow, widening towards the face, which is oblique, facialia with bristles along more than one-third of the length from the frontalia, epistoma not prominent; eyes pubescent, palpi ferruginous; antennæ ex-

tending to the epistoma, third joint cinereous, hardly widening from the base to the tip, which is somewhat truncated, arista slender, very much longer than the third joint; thorax with four indistinct black stripes; scutellum ferruginous hindward; abdomen conical, not longer than the thorax, with three broad, slightly interrupted, cinereous bands, second segment indistinctly ferruginous on each side; legs stout; wings grey, slightly brownish in front, veins black, testaceous towards the base, præbrachial vein forming an obtuse angle at its flexure, hardly curved inward from thence to its tip, discal transverse vein very slightly undulating, parted by much less than its length from the border and from the flexure of the præbrachial; alulae whitish. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

86. *EURYGASTER DECIPIENS*, n. s. *Fæm.* Nigra, aureo-tomentosa, capite antico argenteo frontaliibus atris, antennis ferrugineis, thorace vittis quatuor nigris, abdomine fulvo subtessellato vitta basali nigra, pedibus fulvis, alis cinereis.

Female. Black, stout, with gilded tomentum. Head silvery white in front and beneath, frontalia deep black, widening slightly towards the upright face, the bristles on each side hardly extending to the facialia, epistoma not prominent; eyes bare; antennæ ferruginous, extending to the epistoma, third joint linear, somewhat truncated at the tip, more than four times the length of the second joint, arista slender, much longer than the third joint; thorax with numerous long bristles, with four slight black stripes; pectus cinereous; abdomen tawny, conical, not longer than the thorax, with short stout bristles, and with three broad, slightly gilded, somewhat interrupted bands, a short black stripe at the base; legs tawny, stout, tibiæ darker than the femora, tarsi piceous; wings grey, somewhat darker in front, veins black, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, discal transverse vein nearly straight, parted by more than half its length from the border, and by a little less than its length from the flexure of the præbrachial; alulae slightly cinereous. Length of the body 4 lines; of the wings 7 lines.

87. *EURYGASTER PHASIOIDES*, n. s. *Mas.* Nigra, cano-tomentosa, capite albo frontaliibus atris, antennis, scutello, abdomine femoribusque fulvis, abdomine fasciis duabus posticis albidis vittaque nigra, alis cinereis basi albis, costa plagaque nigricantibus.

Male. Black, with hoary tomentum. Head white, frontalia deep black, widening towards the upright face, facialia with bristles along more than half the length from the epistoma, which is not prominent; eyes bare; palpi testaceous; antennæ tawny, extending to the epistoma, third joint linear, slightly rounded at the tip, more than four times the length of the second joint, arista slender, much longer than the third joint; thorax with four very slender black stripes;

abdomen tawny, short-oval, not longer than the thorax, with a black stripe which does not extend to the tip, third and fourth segments with a white band along each fore border; legs very stout, femora tawny; wings cinereous, white and with testaceous veins at the base, blackish along the costa, and with a broad black band which is abbreviated hindward, præbrachial vein forming an obtuse angle at its flexure, from whence it is very slightly curved inward to its tip, discal transverse vein nearly straight, parted by much less than its length from the border, and by hardly less than its length from the flexure of the præbrachial; alulæ whitish. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Subfam. DEXIDES, *Walk.*

Gen. RUTILIA, *Desv.*

88. *Rutilia plumicornis*, *Guérin*, *Macq. Dipt. Exot.* 11. 3. 82. 3. Pl. 9. f. 8.

Inhabits also Offak, New Guinea.

89. *RUTILIA ANGUSTIPENNIS*, n. s. *Fæm.* Nigro-viridis, capite cinereo frontalibus atris, thoracis lateribus subpurpurascens, scutello purpureo, abdomine viridi basi purpureo, tibiis ferrugineis, alis angustis lanceolatis obscure fuscis basi nigris.

Female. Blackish-green. Head cinereous, frontalia deep black, widening much towards the face, epistoma very prominent, arista stout, bare; thorax with almost obsolete stripes, purplish along each side; scutellum mostly purple; abdomen dark green, purple at the base; legs black, tibiæ ferruginous; wings narrow, lanceolate, dark brown, black towards the base, præbrachial vein forming a much rounded angle at its flexure, near which it is slightly curved inward, and is thence straight to its tip, discal transverse vein very slightly undulating, parted by less than half its length from the border, and by much more than half its length from the flexure of the præbrachial; alulæ dark brownish cinereous. Length of the body 8 lines; of the wings 16 lines.

Gen. DEXIA, *Meigen.*

90. *DEXIA PECTORALIS*, n. s. *Fæm.* Testacea, capite pectoreque albis frontalibus atris, antennis fulvis, thorace cinereo vittis quatuor nigris, abdomine fulvo apicem versus spinoso fasciis duabus nigris, pedibus longis tibiis tarsisque nigris, alis cinereis venis subfusco late marginatis.

Female. Testaceous. Head white, frontalia deep black, widening towards the face, facialia without bristles, epistoma prominent; antennæ tawny, not reaching the epistoma, third joint of the antennæ long, linear, arista plumose; thorax cinereous, with four black stripes, of which the inner pair are much narrower than the outer pair; scu-

tellum tawny hindward ; pectus white ; abdomen tawny, with a few spines towards the tip, hind borders of the third and fourth segments and tips black ; legs long, black, coxæ and femora testaceous ; wings grey, veins very broadly bordered with pale brown, præbrachial vein forming a slightly obtuse angle at its flexure, between which and its tip it is slightly curved inward, discal transverse vein undulating, parted by about half its length from the border, and by a little less than its length from the flexure of the præbrachial ; alulæ cinereous. Length of the body 4 lines ; of the wings 9 lines.

Gen. PROSENA, *St.-Farg.*

91. PROSENA ARGENTATA, n. s. *Mas et Fœm.* Testacea (mas) aut nigra (fœm.), capite thoraceque argenteis, antennis fulvis, abdomine longo fasciis vittaque nigris (mas) aut brevior fasciis cinereis lateribusque basi testaceis (fœm.), pedibus nigris femoribus testaceis, alis subfusciscentibus (mas) aut cinereis (fœm.).

Male and Female. Head and thorax with bright silvery tomentum, facia without bristles, epistoma slightly prominent ; eyes bare ; mouth black, testaceous towards the base, full as long as the thorax ; antennæ tawny, not reaching the epistoma, arista plumose ; legs black, coxæ and femora testaceous ; wings grey, veins black. *Male.* Testaceous. Pectus mostly white ; abdomen elongate-conical, with slight whitish reflexions, dorsal stripe and hind borders of the segments black ; legs long ; wings brownish towards the costa and about the veins, præbrachial vein forming a slightly obtuse angle at its flexure, between which and its tip it is very slightly curved inward, discal transverse vein hardly undulating, parted by less than half its length from the border, and by less than its length from the flexure of the præbrachial. Length of the body 5 lines ; of the wings 10 lines. *Female.* Black. Pectus silvery ; scutellum deep black ; abdomen conical, with broad cinereous bands, first and second segments with broad interrupted testaceous bands, a testaceous mark on each side of the third segment at the base ; legs rather long, femora with black tips ; præbrachial vein forming a right angle at its flexure, curved inward from thence to its tip, discal transverse vein curved inward near its hind end, parted by less than its length from the border and from the flexure of the præbrachial. Length of the body $3\frac{1}{2}$ lines ; of the wings 7 lines.

Subfam. SARCOPHAGIDES, *Walk.*

Gen. SARCOPHAGA, *Meigen.*

92. SARCOPHAGA COMPTA, n. s. *Fœm.* Nigra, cinereo-tomentosa, capite aurato subtus fulvo piloso, thorace vittis tribus nigris, abdomine tessellato, alis obscure cinereis.

Female. Black, with cinereous tomentum. Head gilded in front, clothed behind and beneath with tawny hairs, frontalia deep black,

hardly widening towards the face; thorax with three black very distinctly marked stripes, the middle one dilated on the scutellum; abdomen distinctly tessellated with six large cinereous excavated spots; wings grey, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein hardly undulating, parted by much less than its length from the border, and by little more than half its length from the flexure of the præbrachial; alulae white. Length of the body 5 lines; of the wings 10 lines.

93. *SARCOPHAGA INVARIA*, n. s. *Mas et Fam.* Nigra, cinereo-tomentosa, capite *maris* albo, thorace vittis quinque nigris, abdomine tessellato, alis cinereis.

Male and Female. Black, with cinereous tomentum. Thorax with five black stripes, the lateral pair incomplete; abdomen distinctly tessellated, the spots being much excavated; wings grey, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein hardly undulating, parted by much less than its length from the border, and by rather more than half its length from the flexure of the præbrachial; alulae white. *Male.* Head silvery white, frontalia deep black, linear; tomentum of the thorax and of the abdomen more whitish than that of the female. *Female.* Frontalia slightly widening towards the face. Length of the body 4-4½ lines; of the wings 8 lines.

Subfam. MUSCIDES, *Walk.*

Gen. *IDIA*, *Meigen.*

94. *Idia australis*, *Walk. Cat. Dipt.* pt. 4. 809.
Inhabits also Australia.

95. *IDIA ÆQUALIS*, n. s. *Fam.* *Ænea*, capite subtuberculato, thoracis lateribus pectoreque albido-testaceis lineis duabus lateralibus æneis, abdomine fulvo fasciis tribus æneis, pedibus testaceis tibiis apice femoribusque æneis, alis cinereis apice nigricantibus.

Female. *Æneous*-whitish, testaceous beneath. Head with minute tubercles on each side of the front, frontalia piceous, linear; thorax with an *æneous* stripe on each side in a line with the base of the wings, and with numerous points between these lines and the disk; abdomen pale tawny, with three *æneous* bands on the hind borders of the segments; legs testaceous, tibiae towards the tips and femora *æneous*; wings greyish, with blackish tips, præbrachial vein forming an obtuse and much-rounded angle at its flexure, from whence it is almost straight to its tip, discal transverse vein parted by about half its length from the border and by about its length from the flexure of the præbrachial; alulae very slightly cinereous; halteres testaceous. Length of the body 3½ lines; of the wings 6 lines.

Gen. *MUSCA*, *Linn.*

96. *MUSCA GLORIOSA*, n. s. (genus *Silbomyia*, *Macq.*). *Fæm.* Cyaneo-viridis, capite lætissime aurato frontalibus atris, antennis pedibusque nigris, thorace vittis quatuor cupreis, pectore maculis quatuor albis, abdomine viridi-cyaneo, vitta tenui purpurea, alis cinereis apud costam nigris, alulis albis.

Female. Golden green. Head brilliantly gilded, frontalia deep black, widening towards the face; a brilliantly-gilded lanceolate streak between the antennæ, which are black; epistoma piceous, slightly prominent; thorax with four cupreous stripes; pectus with four white tomentose spots; abdomen greenish blue with a very slender purple stripe; legs black, femora blackish green; wings grey, black for full one-third of the breadth from the costa, præbrachial vein forming a very obtuse angle at its flexure, from whence it is nearly straight to its tip, discal transverse vein very slightly undulating, parted by less than half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ pure white. Length of the body 6 lines; of the wings 12 lines.

97. *MUSCA OPULENTA*, n. s. (genus *Silbomyia*, *Macq.*) *Fæm.* Aureo-viridis, capite aurato, frontalibus atris, antennis piceis, thorace vittis quatuor subobsoletis cupreis, pectore maculis duabus albis, alis cinereis apud costam nigris, alulis albis.

Female. Golden green. Head brightly gilded, frontalia deep black, linear, epistoma piceous, slightly prominent; antennæ piceous; thorax with four almost obsolete cupreous stripes; pectus with a spot of white tomentum on each side; abdomen with a very indistinct cupreous stripe; tibiæ and tarsi black; wings grey, black along the costa, præbrachial vein forming a right angle at its flexure, near which it is slightly curved inward, and is thence straight to its tip, discal transverse vein undulating, parted by more than half its length from the border and from the flexure of the præbrachial; alulæ white. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

98. *MUSCA MACULARIS*, n. s. (genus *Chrysomyia*? *Desv.*) *Mas et Fæm.* Aureo-viridis, capite argenteo antice aurato frontalibus atris, antennis pedibusque nigris, thorace vittis tribus cupreis vix conspicuis, scutello cyaneo, pectore maculis quatuor lateralibus albo tomentosis, abdomine viridi-cyaneo maculis quatuor lateralibus albis, alis cinereis basi nigricantibus, alulis nigricantibus.

Male and Female. Golden green. Head brightly gilded, white behind; antennæ, tibiæ, and tarsi black; thorax with three indistinct cupreous stripes; scutellum blue; pectus with two white tomentose spots on each side; abdomen greenish blue with two transverse white spots on each side; femora blackish-green; wings grey, blackish at the base, præbrachial vein forming a slightly obtuse angle at its flexure, nearly straight from thence to its tip, discal transverse vein curved

outward towards its fore end, parted by about half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ blackish. *Female*. Head with a silvery white vertex, frontalia deep black, linear. Length of the body 56 lines; of the wings 10-12 lines.

99. *MUSCA MARGINIFERA*, n. s. (genus *Lucilia*, *Desv.*) *Fæm.* Viridicyanea, capite albido frontalibus atris, antennis pedibusque nigris, abdominis segmentis purpureo marginatis, alis cinereis basi subnigricantibus, alulis cinereis.

Female. Greenish-blue. Head whitish, frontalia deep black, linear, face and third joint of the antennæ cinereous; abdomen with a purple band on the hind border of each segment; legs black; wings grey, almost blackish at the base, præbrachial vein forming a hardly obtuse angle at its flexure, between which and its tip it is hardly curved inward, discal transverse vein nearly straight, parted by about half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ cinereous. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

100. *MUSCA BENEDICTA*, n. s. (genus *Pyrellia*, *Desv.*) *Mas.* Aureoviridis, capite albo, antennis pedibusque nigris, alis cinereis basi subluridis venis basi fulvis, alulis testaceo-cinereis. *Var.?* Abdominis apice purpureo.

Male. Golden green. Head white in front; antennæ and legs black; wings cinereous, slightly lurid towards the base, veins tawny towards the base, præbrachial vein curved at the flexure, almost straight from thence to the tip, discal transverse vein slightly undulating, parted by full half its length from the border, and by little less than its length from the flexure of the præbrachial; alulæ cinereous with a testaceous tinge. *Var.?* or a distinct species: darker; abdomen purple at the tip. Length of the body 3 lines; of the wings 6 lines.

101. *MUSCA OBTRUSA*, n. s. (genus *Pyrellia*, *Desv.*) *Mas et Fæm.* Purpurco-cyanea, antennis pedibusque nigris, alis cinereis, alulis obscurioribus.

Very nearly allied to *M. refixa* and to *M. perfixa*, but differing slightly in the veins of the wings. *Male and Female*. Blue, more or less mingled with purple. Head black, slightly cinereous in front; antennæ and legs black; wings grey, veins black, præbrachial vein forming an almost angular curve at its flexure, nearly straight from thence to its tip, discal transverse vein very slightly undulating, parted by little more than half its length from the border, and by about its length from the flexure of the præbrachial; alulæ dark cinereous. Length of the body $2\frac{1}{2}$ -3 lines; of the wings 5-6 lines.

102. *Musca domestica*, *Linn.* See Vol. I. p. 128.

103. *MUSCA OBSCURATA*, n. s. *Fæm.* Nigra, subcinerascens, capite postico albo, thorace vittis quatuor angustis nigris, abdomine tessellato.

lato, alis obscure cinereis apud costam nigricantibus, alulis testaceo-cinereis.

Female. Black, slightly covered with cinereous tomentum. Head white behind; thorax with four slender black stripes; abdomen distinctly tessellated with four rows of cinereous reflecting spots; wings very dark grey, blackish towards the costa, præbrachial vein forming a somewhat rounded and very slightly obtuse angle at its flexure, hardly curved inward from thence to its tip, discal transverse vein slightly undulating, parted by less than half its length from the body, and by more than half its length from the flexure of the præbrachial; alulæ cinereous, with a testaceous tinge. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

104. *MUSCA PATIENS*, n. s. *Fam.* Nigra, cinereo-tomentosa, frontilibus antennisque piceis, thorace vittis quatuor tenuissimis nigris, abdomine tessellato, alis cinereis.

Female. Black, with cinereous tomentum. Head whitish behind, frontalia piceous, linear; antennæ piceous; thorax with four very slender black stripes; abdomen tessellated; wings grey, veins black, præbrachial vein forming an obtuse and somewhat rounded angle at its flexure, from whence it is hardly curved inward to its tip, discal transverse vein undulating, parted by less than half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ slightly cinereous, with testaceous borders. Length of the body 3 lines; of the wings 6 lines.

105. *MUSCA ERISTALOÏDES*, n. s. (genus *Pollenia*? *Desv.*) *Mas et Fam.* Aureo tomentosa, crassa, subtus testacea, capite antice albo frontilibus antice rufis, antennis piceis basi rufis, thorace vittis tribus abbreviatis fulvis, scutello cyaneo, abdomine cyaneo basi fasciisque duabus albis, pedibus fulvis, tibiis tarsisque nigris, alis cinereis apud costam fusciscentibus. *Var. mas.* Minor, thorace vittis tribus nigris.

Male and Female. Body thick; head white; frontalia of the female piceous, linear, red in front; epistoma prominent; proboscis long; palpi whitish; antennæ piceous, red at the base; thorax with gilded tomentum, and with three tawny bands which are abbreviated hindward, scutellum blue; pectus testaceous; abdomen blue, white at the base and with two white bands on the 3rd and 4th segments, 1st segment with a transverse blue spot on each side; legs tawny, tibiæ and tarsi black; wings grey, blackish along the exterior part of the costa, præbrachial vein forming a right but rounded angle at its flexure, near which it is curved inward and is thence straight to its tip, discal transverse vein slightly undulating, parted by a little more than half its length from the border, and by much more than half its length from the flexure of the præbrachial; alulæ testaceous. *Var. Male.* Smaller; thorax with three black stripes; abdomen with only

one white band, which is on the 4th segment. Length of the body 4-5 lines; of the wings 8-10 lines.

Gen. BENGALIA, *Desv.*

106. BENGALIA SPISSA, n. s. *Mas et Fœm.* Fulva, capite nigro antice albo, antennis testaceis, pectore fasciis duabus obliquis albidis, pedibus nigris femoribus basi coxisque fulvis, alis cinereis.

Male and Female. Tawny. Head black, with silvery tomentum in front, epistoma not prominent; palpi black; antennæ testaceous; pectus with an oblique whitish band on each side; legs black, femora towards the base and coxæ tawny; wings grey, veins black, testaceous towards the base, præbrachial vein forming an obtuse and rounded angle at its flexure, which is very near the border of the wing, straight from thence to its tip, discal transverse vein straight, parted by much less than its length from the border, and by very much more than its length from the flexure of the præbrachial; alulæ testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Subfam. ANTHOMYIDES, *Walk.*

Gen. ARICIA, *Macq.*

107. ARICIA SIGNIFICANS, n. s. *Mas et Fœm.* Fulva, subtus testacea, capite nigro argenteo-tomentoso, antennis testaceis, thorace vittis tribus albidis, abdominis apice piceo, alis cinereis.

Male and Female. Tawny, testaceous beneath. Head black, with silvery tomentum, vertex much broader in the female than in the male; palpi tawny; antennæ testaceous; thorax with three whitish stripes in the disk, and with one on each side; abdomen piceous at the tip; tarsi blackish towards the tips; wings cinereous, veins black, tawny towards the base, discal transverse vein hardly undulating, parted by more than its length from the præbrachial transverse, and by less than its length from the border; alulæ pale cinereous, with testaceous borders. Length of the body 4 lines; of the wings 7 lines.

108. ARICIA CANIVITTA, n. s. *Fœm.* Fulva, subtus testacea, capite nigro, facie argentea, palpis antennisque testaceis, thoracis disco, abdominis plagis duabus trigonis pedibusque nigris, thorace vitta cana, alis cinereis.

Female. Tawny, testaceous beneath. Head black, face silvery; palpi and antennæ testaceous; disk of the thorax blackish, with a broad hoary stripe; disk of the scutellum piceous; second and third segments of the abdomen with triangular black bands; legs black, coxæ and trochanters testaceous; wings grey, veins black, discal transverse vein hardly curved inward, parted by more than half its length from the border, and by a little less than its length from the præbrachial transverse; alulæ pale cinereous, with testaceous borders. Length of the body $3\frac{1}{2}$ lines, of the wings 7 lines.

Gen. *ANTHOMYIA*, *Meigen*.

109. *ANTHOMYIA PROCELLARIA*, n. s. *Mas.* Nigra, subtus albida, capite argenteo, thorace fasciis duabus (prima interrupta) albis, abdomine vitta tenui fasciisque interruptis albidis, alis cinereis, halteribus testaceis.

Nearly allied to *A. pluvialis* and to *A. tonitru*. *Male*. Black, whitish beneath. Head silvery; thorax with two whitish bands, the first interrupted in the middle, widened on each side; scutellum elongate; abdomen with a slender whitish stripe, and with interrupted whitish bands, which are widened on each side; wings grey, veins black, discal transverse vein nearly straight, parted by less than half its length from the border and by hardly less than its length from the præbrachial transverse; alulae grey, with testaceous borders; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Gen. *CÆNOSIA*, *Meigen*.

110. *CÆNOSIA LUTEICORNIS*, n. s. *Mas.* Cana, capite antennisque pallide luteis, abdomine basi testaceo maculis octo nigris, pedibus halteribusque testaceis, alis sublimpidis apice nigris.

Male. Hoary. Head pale luteous, frontalia darker, widening towards the face; palpi white; antennae pale luteous, extending to the epistoma, third joint long, slender, linear, arista plumose for half the length from the base; abdomen testaceous towards the base, with four dorsal black spots and with two black spots on each side towards the tip; legs testaceous; wings nearly limpid, with a black apical spot, discal transverse vein nearly straight, parted by less than its length from the border and by very much more than its length from the præbrachial transverse; alulae white; halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

Subfam. *HELOMYZIDES*, *Fallen*.Gen. *CÆLOPA*, *Meigen*.

111. *CÆLOPA INCONSPICUA*, n. s. *Fam.* Cinerea, antennis piceis, pectore antico, abdomine pedibusque fulvis, his nigro variis, alis cinereis, halteribus testaceis.

Female. Cinereous, flat. Antennae piceous; fore part of the pectus, abdomen and legs tawny, the latter with diffuse blackish bands; wings grey, veins black, with the usual structure, tawny towards the base; halteres testaceous. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Gen. *XARNUTA*, *Walk*.

112. *Xarnuta leucotelus*, *Walk*. See Vol. I. p. 28.

Gen. *HELOMYZA*, *Fallen*.

113. *HELOMYZA PICIPES*, n. s. *Fæm.* Fulva, capite, antennis femoribusque nigris, abdominis segmentis nigro marginatis, tibiis tarsisque piceis, alis cinereis apud costam luridis vena discali transversa fusco subnebulosa, halteribus testaceis. *Var.* Thoracis vitta lata abdomineque piceis.

Female. Tawny. Head and antennæ black, arista plumose; thorax with two slender, darker, almost obsolete stripes; hind borders of the abdominal segments black; legs piceous, femora black, coxæ tawny; wings grey, with a lurid tinge towards the costa, discal transverse vein straight, slightly clouded with brown, parted by about half its length from the border, and by more than twice its length from the præbrachial transverse; halteres testaceous. *Var.* Thorax with a broad piceous stripe; abdomen piceous. Length of the body 3 lines; of the wings 6 lines.

114. *HELOMYZA ATRIPENNIS*, n. s. *Mas.* Fulva, scutello nigro, pectore piceo, abdomine ferrugineo, alis nigris postice cinereis.

Male. Tawny. Antennæ pale tawny, arista plumose; thorax with two slender, darker, almost obsolete stripes; scutellum black; pectus piceous; abdomen ferruginous; wings black, cinereous along the hind border for more than half its length from the base, veins as in the preceding species. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

115. *HELOMYZA RESTITUTA*, n. s. *Fæm.* Testacea, abdomine punctis sex nigris, alis cinereis apice nigricantibus venis transversis nigricante nebulosis.

Female. Testaceous. Third, fourth, and fifth segments of the abdomen with two black points on each fore border; wings grey, with a slight lurid tinge towards the costa, blackish at the tips, transverse veins clouded with blackish, veins with the usual structure. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Gen. *DRYOMYZA*, *Fallen*.

116. *DRYOMYZA SEMICYANEA*, n. s. *Fæm.* Ferruginea, vertice picco, antennis fulvis, thorace cyanescente, abdomine cyaneo basi ferrugineo, pedibus testaceis, alis subcinereis apud costam luridis.

Female. Ferruginous. Vertex piceous, face slightly covered with whitish tomentum; antennæ tawny, arista very minutely pubescent; thorax tinged with blue; abdomen blue, tawny at the base; legs testaceous; wings greyish, lurid along the costa, veins tawny, præbrachial vein forming a very slight angle where it joins the discal transverse, with a slight curve from thence to its tip, præbrachial transverse stout, slightly clouded, discal transverse straight, upright, parted by much less than half its length from the border and by a

little more than its length from the præbrachial transverse; halteres testaceous. Length of the body $3\frac{1}{2}$ – $4\frac{1}{2}$ lines; of the wings 7–9 lines.

Gen. SEPEDON, *Latr.*

117. SEPEDON COSTALIS, n. s. *Mas*. Cinerea, capite testaceo guttis quatuor nigris, antennis nigris basi testaceis arista alba, abdomine pedibusque fulvis femoribus posticis denticulatis, alis fusciscenti-cinereis, costa testacea.

Male. Cinereous. Head testaceous, with a black dot on each side above and two more towards the mouth; antennæ black, testaceous at the base, second joint very long, arista white; thorax with four slender indistinct darker lines, pectus hoary; abdomen and legs tawny, tarsi piceous, hind femora denticulated; wings brownish cinereous, slightly testaceous along the costa; halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Subfam. LAUXANIDES, *Walk.*

Gen. LAUXANIA, *Latr.*

118. LAUXANIA DUPLICANS, n. s. *Fæm.* Nigro-cyanea, antennis piceis, articulo tertio longissimo, tarsis basi albidis, tibiis intermediis sordide albidis, alis limpidis.

Female. Blackish-blue, shining. Antennæ piceous, third joint very long, reddish beneath, arista bare; legs black, tarsi whitish towards the base, middle tibiæ dingy whitish; wings limpid, veins pale, discal transverse vein white, parted by a little less than its length from the border and by nearly twice its length from the præbrachial transverse; halteres white. Length of the body 2– $2\frac{1}{2}$ lines; of the wings 3–4 lines.

119. LAUXANIA MINUENS, n. s. *Fæm.* Nigra, nitens, antennis longis arista nuda, tarsis albidis, alis sublimpidis, halteribus albis.

Female. Black, shining. Third joint of the antennæ long, arista bare; tarsi whitish; wings very slightly greyish, veins pale, of the usual structure; halteres white. Length of the body $1\frac{1}{4}$ line; of the wings $2\frac{1}{2}$ lines.

Gen. LONCHÆA, *Fallen.*

120. LONCHÆA? INOPS, n. s. *Mas et Fæm.* Nigra, nitens, antennis piceis arista plumosa, scutello ferrugineo, tibiis, tarsis halteribusque fulvis, alis subcinereis.

Male and Female. Black, shining. Antennæ piceous, third joint short, arista plumose; scutellum somewhat ferruginous; tibiæ, tarsi, and halteres tawny; wings slightly greyish, veins pale, discal transverse vein parted by much less than its length from the border and by nearly twice its length from the flexure of the præbrachial. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Subfam. ORTALIDES, *Haliday*.Gen. LAMPROGASTER, *Macq.*

121. LAMPROGASTER QUADRILINEA, n. s. *Mas et Fæm.* Cyaneo-viridis; capite pedibusque nigris; antennis piceis, basi rufis; thorace vittis quatuor albidis; abdomine purpureo-cyaneo; alis limpidis, litura basali, fasciis duabus (prima abbreviata, secunda interrupta) strigaque costali apicali nigris.

Male and Female. Bluish green. Head black; proboscis red at the tip; antennæ piceous, red at the base; thorax with two whitish stripes on each side; abdomen purplish blue; legs black, tarsi with pale tomentum towards the base; wings limpid, two black streaks, one basal including a limpid dot, the other apical, first band oblique, extending from the costa to the disk, second widely interrupted in the middle, its hind part occupying the discal transverse vein; veins black, testaceous along the costa; præbrachial vein forming a slight angle at its junction with the discal transverse, the latter parted by not more than one-fourth of its length from the border, and by more than its length from the præbrachial transverse. Length of the body $3\frac{1}{2}$ – $4\frac{1}{2}$ lines; of the wings 7–9 lines.

122. LAMPROGASTER MARGINIFERA, n. s. *Fæm.* Testacea; capite maculis duabus fasciaque nigro-æneis; thoracis disco nigro-æneo, vittis tribus testaceis, vittis duabus lateralibus albidis, scutelli margine testaceo; abdominis dorso nigro-æneo; alis limpidis, fasciis plurimis fuscis.

Female. Testaceous. Head with two blackish æneous spots on the vertex, and with a blackish æneous band in front; mouth and antennæ tawny; disk of the thorax blackish æneous, with three testaceous stripes which are united in front, the middle one slender, the lateral pair united on the border of the scutellum, a whitish stripe on each side; abdomen blackish æneous above; wings limpid, with eight or nine irregular brown bands; veins black, testaceous along the costa; discal transverse vein parted by much less than its length from the border, and by about its length from the præbrachial transverse. Length of the body 4 lines; of the wings 9 lines.

123. LAMPROGASTER DELECTANS, n. s. *Fæm.* Ferruginea; capite testaceo, postice albido, vertice luteo fasciis duabus nigris, vittis quatuor anticis antennisque nigris; thorace vittis septem et metathoracis fascia albidis; abdomine cyaneo-viridi, basi discoque fulvis; pedibus nigricantibus, femoribus testaceis apice nigris; alis sublimpidis, costa, striga obliqua subcostali guttaque marginali nigricantibus.

Female. Ferruginous. Head testaceous, whitish behind; vertex luteous, blackish in front and behind; fore part with four blackish stripes; antennæ blackish; thorax with seven whitish stripes, the middle one broad, the inner pair very slender, the second pair broad, the third pair lateral; abdomen bluish green, slightly varied with

purple, base and fore part of the disk tawny; legs blackish; femora testaceous, with black tips; wings nearly limpid, with a slight lurid tinge in the discal areolet, blackish along the costa, and with a blackish oblique streak which extends from the costa along the præbrachial transverse vein; a blackish dot on the hind end of the discal transverse vein; veins black, discal transverse vein parted by about one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse which is very oblique; alulae white; halteres testaceous, with black knobs. Length of the body 5 lines; of the wings 9 lines.

124. *LAMPROGASTER SCUTELLARIS*, n. s. *Mas.* *Subcinereo-nigra*; oculis albido submarginatis; thorace vittis tribus cinereis, vittis duabus lateralibus, scutelli subquadrati margine, tibiis intermediis tarsisque albidis; alis nigricantibus, fasciis duabus integris duabusque macularibus incompletis albidis.

Male. Black, with a slight cinereous tinge; eyes partly bordered with whitish; third joint of the antennæ elongate-conical; arista plumose, the bristles few; thorax with three indistinct cinereous stripes, and with two whitish lateral stripes; scutellum nearly quadrate, with a whitish border; middle tibiae, knees and tarsi whitish, the latter with black tips; wings blackish, whitish at the base, and with four whitish bands, first and third bands entire, second and fourth macular, very irregular and incomplete; veins black; discal transverse vein straight, parted by about one-fourth of its length from the border, and by hardly more than its length from the præbrachial transverse. Length of the body 2 lines; of the wings 4 lines.

This species has some resemblance to the genus *Platystoma*, and differs rather from the characters of *Lamprogaster*; it and the two following species, which are still more aberrant, will probably be considered as three new genera.

125. *LAMPROGASTER CELYPHOÏDES*, n. s. *Mas et Fæm.* *Atra, nitens, brevis, lata*; capite, antennis pedibusque testaceis; abdomine nigro-cyaneo; alis limpidis, strigis transversis subcostalibus fusciscentibus.

Male and Female. Deep black, shining, short, broad. Head testaceous, face transverse; antennæ testaceous, third joint elongate-conical; arista bare; abdomen blackish blue, second segment very large, third and following not visible; legs testaceous; wings limpid, with four transverse pale brown subcostal streaks; discal transverse vein parted by less than half its length from the border, and by less than its length from the flexure of the præbrachial; halteres testaceous. Length of the body 2-2½ lines; of the wings 4½ lines.

126. *LAMPROGASTER TETRYOÏDES*, n. s. *Mas.* *Atra, nitens, brevissima, latissima*; capite transverso, subruguloso; thorace scitissima punctato; abdomine cyaneo; tarsis flavis; alis nigris albido punctatis apud marginem posticum obscure cinereis.

Male. Deep black, shining, very short and broad. Head transverse, slightly rugulose; third joint of the antennæ conical; arista thinly plumose; thorax very finely punctured; scutellum almost semicircular; abdomen blue, smooth; tarsi yellow; wings black, dark grey towards the hind border, with whitish points towards the costa; discal transverse vein parted by about its length from the border and by more than its length from the præbrachial transverse. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Gen. PLATYSTOMA, *Latr.*

127. PLATYSTOMA FUSIFACIES, n. s. *Mas et Fœm.* Cinerea; capite postice et apud oculos albo; vertice pallide luteo (mas) aut rufo (fœm.); facie plana, fusiformi, subargentea; antennis piceis; thoracis vittis tribus pectoreque canis; abdomine conico punctis albis; alis limpidis, guttis transversis interioribus fasciisque exterioribus nigricantibus.

Male and Female. Cinereous. Head white hindward and about the eyes, black and shining towards the mouth; vertex pale luteous in the male, red in the female; face flat, fusiform, somewhat silvery; antennæ piceous, third joint long, slender, linear, arista plumose; thorax with three hoary stripes, the middle one much broader than the lateral pair; pectus hoary; abdomen conical, with numerous white points; wings limpid, with blackish dots towards the base, and with four exterior blackish bands, two of which are dilated towards the costa, and there contain some limpid dots; veins black, discal transverse vein straight, parted by about one-fourth of its length from the border, and by more than its length from the præbrachial transverse; halteres whitish. Length of the body $3\frac{1}{2}$ –5 lines; of the wings 8–10 lines.

128. PLATYSTOMA MULTIVITTA, n. s. *Mas.* Cinerea; capite postice et apud oculos albo, vertice luteo, facie et antennis fulvis; thoracis vittis octo pectoreque canis; abdominis segmentis cano fasciatis; ventre ferrugineo; pedibus nigris; alis limpidis, fasciis quatuor strigisque interioribus nigricantibus.

Male. Cinereous. Head white behind and about the eyes, vertex luteous; face and antennæ tawny, third joint of the latter long, slender, linear; arista very slightly plumose; thorax with eight hoary stripes; pectus hoary; abdomen with a hoary band on the fore border of each segment; legs black; wings limpid, with four blackish bands, and with some blackish marks nearer the base; two blackish streaks between the first and second bands; veins black; discal transverse vein straight, parted by one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse; halteres black. Length of the body 4 lines; of the wings 8 lines.

Gen. DACUS, *Fabr.*

129. DACUS EXPANDENS, n. s. *Fæm.* Fulvus, latiusculus; antennarum articulo tertio piceo angusto lineari longissimo; abdomine vitta tenui nigricante; alis limpidis, costa vittaque postica fusciscentibus.

Female. Tawny, rather broad, very slightly covered with hoary tomentum, which forms stripes on the thorax and indistinct bands on the abdomen; third joint of the antennæ piceous, slender, linear, very long; arista bare; abdomen with a slender blackish stripe; wings limpid, brownish along the costa, and with a short oblique brownish stripe extending from the base to the interior border; veins black, discal transverse vein oblique, parted by full one-fourth of its length from the border, and by more than its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

130. DACUS PECTORALIS, n. s. *Fæm.* Cinereo-niger; capite fulvo, facie guttis duabus nigris; antennarum articulo tertio piceo angusto lineari longissimo; callis duabus humeralibus, fasciis duabus obliquis pectoralibus lateralibus, scutello tarsisque testaceis; thoracis vittis tribus abdominisque una canis; pedibus fulvis piceo cinetis; alis limpidis, costa vittaque postica fusciscentibus.

Female. Black, slightly covered with cinereous tomentum. Head tawny, with two small black dots on the face; third joint of the antennæ piceous, slender, linear, very long, arista bare; thorax with three indistinct hoary stripes; humeral calli, an oblique band on each side of the pectus, scutellum and tarsi, testaceous; abdomen with one hoary stripe; legs tawny, with diffuse piceous bands; wings limpid, brownish along the costa, and with a short oblique brownish stripe, extending from the base to the interior border; veins black; discal transverse vein parted by less than one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse; halteres testaceous. Length of the body $3\frac{3}{4}$ lines; of the wings $7\frac{1}{2}$ lines.

131. DACUS LATIFASCIA, n. s. *Fæm.* Niger; capite postice et apud oculos albido; antennarum articulo tertio vix longo; thoracis fascia, metathorace pectorisque fasciis duabus obliquis canis; abdomine cyaneo; femoribus albidis apice nigris; alis albo-limpidis, costa atra, fasciis duabus latissimis nigris; halteribus testaceis.

Female. Black. Head whitish behind and about the eyes; third joint of the antennæ linear, round at the tip, hardly long, arista plumose; thorax with a band on the hind border of the scutum; metathorax and an oblique band on each side of the pectus hoary; abdomen blue; coxæ and femora whitish, the latter with black tips; wings limpid white, deep black along the costa, and with two very broad black bands; veins black; discal transverse vein very oblique, parted

by about one-sixth of its length from the border, and by little more than half its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

132. *DACUS MUTILLOIDES*, n. s. *Fæm.* Rufescens; capite nigro, postice et apud oculos albo; antennarum articulo tertio angusto lineari longissimo; thoracis vittis tribus, pectoris fasciis duabus obliquis lateralibus abdominisque fasciis duabus (secunda interrupta) albis, abdominis dimidio postico nigro-æneo; pedibus piceis; alis sublimpidis, costæ apice venisque transversis nigro nebulosis; halteribus albidis.

Female. Reddish. Head black, white behind and about the eyes and on the grooves of the face; antennæ black, reddish at the base, third joint slender, linear, very long, arista bare, rather stout; thorax with three whitish stripes; pectus with a more distinct oblique white band on each side; metathorax whitish; abdomen æneous, pubescent, finely punctured, reddish and slightly contracted towards the base, with two white bands, the second widely interrupted; oviduct long, lanceolate; legs piceous; wings nearly limpid, clouded with black at the tip of the costa and on the præbrachial transverse vein, hardly clouded on the discal transverse vein; veins black; discal transverse vein straight, parted by about one-fourth of its length from the border, and by much more than its length from the præbrachial transverse; halteres whitish. Length of the body 5 lines; of the wings 8 lines.

133. *DACUS LONGIVITTA*, n. s. *Mas.* Æneo-viridis, subpubescens, subtilissime punctatus; capite nigro apud oculos albido, epistomate ferrugineo, antennarum articulo tertio longo lineari; thorace subvittato; pedibus nigris, femoribus ferrugineis; alis subcinereis, costa vittaque apud venam præbrachialem nigris; halteribus piceis.

Male. Æneous green, with slight hoary tomentum, very finely punctured. Head black, whitish about the eyes; epistoma ferruginous, prominent; antennæ black, ferruginous at the base, third joint long, linear, conical at the tip; arista bare; thorax with an indistinct broad hoary stripe; abdomen compressed, nearly linear; legs black; femora ferruginous; wings slightly greyish, black along the costa and with a black stripe which extends along the præbrachial vein to the discal transverse vein; veins black; discal transverse vein straight, oblique, parted by a little more than half its length from the border, and by very much more than its length from the præbrachial transverse; halteres piceous. Length of the body 4-6 lines; of the wings 5-7 lines.

134. *DACUS LATIVENTRIS*, n. s. *Fæm.* Nigro-viridis, subtilissime punctatus; capite piceo apud oculos albido; antennis fulvis, articulo tertio sublanceolato; abdomine brevi, lato; pedibus nigris, femoribus anticis fulvis; alis subcinereis, costa vittaque apud venam præbra-

chiale m nigris, vena discali transversa nigricante nebulosa ; halteribus albidis.

Female. Blackish green, very minutely punctured. Head piceous. whitish about the eyes; epistoma ferruginous, slightly prominent; antennæ tawny, third joint rather long, somewhat lanceolate, arista bare; abdomen nearly round, broader than the thorax; legs black, fore femora tawny; wings very slightly greyish, black along the costa to the tip of the præbrachial vein, with a black stripe along the præbrachial vein to the discal transverse vein, and with a blackish tinge about the discal transverse vein and along the adjoining part of the hind border; veins black, discal transverse straight, vein parted by less than half its length from the border, and by very much more than its length from the præbrachial transverse: halteres whitish. Length of the body 2 lines; of the wings 4 lines.

135. *DACUS OBTRUDENS*, n. s. *Mas.* Nigro-viridis, subtilissime punctatus; capite nigro apud oculos albedo; antennis piceis basi rufescentibus, articulo tertio lineari longissimo; abdomine lineari maculis duabus lateralibus testaceis; pedibus nigris, femoribus apice tarsisque posticis basi fulvis; alis subcinereis, costa, apice maculaque apud venam transversam discalem nigricantibus; halteribus albis.

Male. Dark green, very minutely punctured. Head black, whitish about the eyes, ferruginous towards the epistoma; antennæ piceous, reddish towards the base; third joint linear, very long, arista bare; abdomen linear, compressed, with a testaceous spot on each side before the middle; legs black, femora tawny towards the tips, hind tarsi tawny at the base; wings slightly greyish, blackish along the costa and at the tips, and about the transverse veins; veins black, tawny at the base; discal transverse vein straight, oblique, parted by about half its length from the border, and by a little more than its length from the præbrachial transverse; halteres white. Length of the body 4 lines; of the wings 7 lines.

136. *DACUS POMPILOIDES*, n. s. *Mas.* Niger; capite albedo, epistomate ferrugineo; antennis piceis basi rufis, articulo tertio longo lineari; abdomine nigro-cyaneo; pedibus piceis; alis subcinereis, striga costali basali, fascia tenui postice abbreviata et tridente apicali strigam subcineream includente nigricantibus; halteribus albis.

Male. Black. Head with whitish tomentum, epistoma ferruginous, prominent; antennæ piceous, red at the base, third joint long, linear, arista bare; abdomen linear, blackish blue, longer than the thorax; legs piceous; wings slightly greyish, with a blackish costal streak extending from the base, with a slender blackish band which is abbreviated hindward, and with more than one-third of the apical part blackish and including a slightly greyish streak; veins black, discal transverse vein straight, oblique, parted by a little less than its length from the border and by about its length from the præbrachial trans-

verse; halteres white. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. BREA, n. g.

Platystomæ affinis. *Facies* lata. *Antennæ* breves; articulus tertius longiconicus; arista nuda. *Femora* intermedia incrassata, denticulata. Allied to *Platystoma*. Face broad; antennæ short, third joint elongate-conical; arista bare; middle femora incrassated, denticulated beneath.

137. BREA DISCALIS, n. s. *Mas*. Nigra; capite testaceo apud oculos albido, fronte ochracea; antennis piceis basi rufescentibus; thorace vitta lata cana; abdomine fulvo, disco nigro cupreo; pedibus fulvis, femoribus anticis apice tibiisque anticis basi nigris; alis sublimpidis, fascia media lata postice abbreviata guttam limpidam subcostalem includente lineaque transversa exteriori nigricantibus; halteribus testaceis.

Male. Black. Head testaceous, whitish about the eyes, front ochraceous; antennæ piceous, reddish at the base; thorax with a broad hoary stripe; abdomen tawny, with a blackish cupreous disk; legs tawny, fore femora at the tips and fore tibiæ at the base black; wings nearly limpid, with a broad middle blackish band, which is abbreviated hindward and includes a limpid dot by the costa, and has beyond it a blackish transverse line; veins black, testaceous towards the base; discal transverse vein straight, upright, parted by half its length from the border, and by much more than its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

138. BREA CONTRARIA, n. s. *Mas et Fæm*. Nigra; capite fulvo apud oculos albido, fronte ochracea; antennis rufescentibus; thorace vitta cana; abdomine purpureo apice cyaneo; pedibus nigris, femoribus anticis tarsisque testaceis; alis sublimpidis, fascia lata media postice abbreviata, guttis interioribus lineaque transversa exteriori nigricantibus.

Male and Female. Black. Head tawny, whitish about the eyes; antennæ reddish; thorax with a hoary stripe; sides and pectus also hoary; abdomen purple, blue towards the tip; legs black; tarsi and fore femora testaceous; wings nearly limpid, with a broad blackish middle band which is abbreviated hindward, with some interior blackish dots, and with an exterior transverse blackish line; veins black; discal transverse vein straight, parted by less than half its length from the border, and by less than its length from the præbrachial transverse; halteres black. Length of the body $3-3\frac{1}{2}$ lines; of the wings 6-7 lines.

Gen. ADRAMA, n. g.

Mas. *Corpus* longiusculum. *Caput* thorace vix latius, setis duabus posticis erectis. *Antennæ* sat longæ; articulus tertius linearis, apice

conicus; arista pubescens. *Abdomen* sublineare, thorace longius et angustius. *Pedes* mediocres; femora posteriora spinis minutis armata. *Alæ* sat longæ.

Male. Body rather long. Head transverse, hardly broader than the thorax, with two erect setæ on the hind part of the vertex; face vertical; epistoma slightly prominent. Antennæ nearly reaching the epistoma; third joint long, linear, conical at the tip; arista pubescent. Abdomen almost linear, longer and narrower than the thorax. Legs moderately long and slender; posterior femora with minute spines beneath. Wings rather long; discal transverse vein straight, upright, parted by hardly half its length from the border, and by rather more than its length from the præbrachial transverse.

139. *ADRAMA SELECTA*, n. s. *Mas.* Testacea; capite guttis tribus nigris; thorace disco antico vittisque duabus posterioribus nigris; tibiis tarsisque anticis piceis, tibiis posticis subpiceis; alis subfuscescentibus, fascia lata limpida nigricante marginata postice abbreviata.

Male. Testaceous. Head with a black dot above the antennæ and one on each side of the epistoma; thorax with the fore part of the disk black, and with two hindward black stripes; fore tibiæ and fore tarsi piceous; hind tibiæ somewhat piceous; wings slightly brownish, with two blackish bands, the first on the præbrachial transverse vein, abbreviated hindward, the second on the discal transverse vein, abbreviated in front, intermediate space limpid, veins testaceous, black towards the tips; halteres pale testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. ORTALIS, *Fallen.*

140. *ORTALIS PROMPTA*, n. s. *Fam.* Nigro-viridis; capite piceo apud oculos albido; antennis rufescentibus; thorace vitta abdomineque fasciis cinereis; pedibus nigris; alis limpidis, vittis tribus nigris, prima postice abbreviata, secunda tertiaque latis; halteribus albidis.

Female. Blackish green. Head piceous, whitish about the eyes; epistoma somewhat prominent; antennæ reddish, third joint somewhat lanceolate, piceous towards the tip; arista bare; thorax with a cinereous stripe; sides and pectus also cinereous; abdomen with two cinereous bands; legs black; wings limpid white, slightly cinereous towards the base, with three black bands, the first abbreviated hindward, the second and third very broad; veins black, discal transverse vein curved inward, parted by much less than its length from the border and by a little less than its length from the præbrachial transverse; halteres whitish. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

141. *ORTALIS COMPLENS*, n. s. *Mas et Fam.* Nigro-viridis; capite antennisque testaceis, articulo tertio brevi, arista plumosa; abdomine atro; pedibus testaceis, femoribus nigris; alis albo limpidis, strigis

duabus apiceque nigro-cinereis, fasciis tribus satis nigricantibus; halteribus albis. *Mas.* Vertex luteo postice nigro, femoribus apice testaceis, alarum fasciis subconnexis. *Fæm.* Vertex nigro, tibiis nigris, posticis basi testaceis.

Male and Female. Blackish green. Head testaceous; antennæ testaceous, third joint short, conical; arista plumose; abdomen deep black; legs testaceous; femora black; wings limpid white, with three broad blackish stripes, the second emitting a branch from its outer side to the costa, a streak connected with the outer side of the third band, and the tips blackish cinereous; discal transverse vein straight, parted by much less than its length from the border, and by a little more than its length from the præbrachial transverse; halteres white. *Male.* Vertex luteous, black hindward; femora with testaceous tips; bands of the wings partly connected. *Female.* Vertex black; tibiæ black, the hind pair testaceous towards the base. Length of the body $1\frac{1}{2}$ –2 lines; of the wings 3–4 lines.

Gen. TRYPETA, Meigen.

142. TRYPETA MULTISTRIGA, n. s. *Fæm.* Testacea; thorace pectoreque nigro-strigatis; abdomine maculis quatuor lateralibus anterioribus fascia lata apiceque nigris; femoribus posterioribus nigro vittatis; alis nigricantibus basi marginali maculis guttisque albis.

Female. Testaceous. Third joint of the antennæ short, conical; arista plumose; thorax with black bristles on each side, with eight black streaks, four in front, of which the middle pair are very short, four hindward, the middle pair short, the outer pair connected in front of the scutellum, two lateral black streaks; pectus with a black interrupted streak on each side; disk also black; abdomen with two transverse black spots on each side towards the base, and with a broad black band; oviduct black, flat, lanceolate, obtuse at the tip; posterior femora striped with black; wings blackish, limpid for a space from the base along the costa and along the hind border, and with twelve white marks of various size, four discal, eight marginal; discal transverse vein nearly straight, parted by one-fourth of its length from the border, and by about its length from the præbrachial transverse. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

143. TRYPETA DORSIGUTTA, n. s. *Mas.* Atra; capite piceo vitta testacea, subtus albo; antennis testaceis; thorace cinereo punctis lateralibus albis, pectore albido; abdominis segmentis testaceo marginatis; tibiis albido fasciatis, tarsis albidis; alis albo-limpidis, strigis basalibus fasciisque duabus latis nigricantibus, prima antice furcata; halteribus albis.

Male. Deep black. Head piceous, with cinereous tomentum, white behind and beneath, a testaceous stripe on the vertex; antennæ testaceous, black at the base, third joint conical, white at the base,

arista plumose; thorax with cinereous tomentum, white points along each side; pectus whitish; hind borders of the abdominal segments testaceous with cinereous tomentum; tibiæ with a dingy whitish band; tarsi dingy whitish; wings limpid white, with several blackish marks towards the base and with two broad blackish bands, the first forked in front; discal transverse vein nearly straight, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse; halteres white. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

144. *TRYPETA BASALIS*, n. s. *Mas.* Nigra, nitens; capite antennisque fulvis, vertice maculis duabus piceis; abdomine basi pedibusque testaceis; alis limpidis, striga basali, fasciis tribus costaque apicali nigricantibus; halteribus testaceis.

Male. Black, slender, shining. Head tawny, with two elongated piceous spots on the vertex; antennæ tawny, third joint linear, rather long, arista bare; abdomen nearly fusiform, testaceous at the base; legs testaceous; wings limpid, with a blackish oblique streak extending from the base, with three blackish bands, and with a blackish costal streak extending round the tip, first and third bands slender, second broad, abbreviated like the first hindward; discal transverse vein straight, parted by about one-fourth of its length from the border, and by less than its length from the præbrachial transverse; halteres testaceous. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

145. *TRYPETA IMPLETA*, n. s. *Fæm.* Cinerea; capite albido; antennarum articulo tertio albido apice nigro; thorace vitta fusca, scutello albido, abdomine nigro; pedibus albidis nigro fasciatis; alis albis, maculis plurimis nigricantibus ex parte confluentibus; halteribus albidis.

Female. Cinereous. Head whitish; third joint of the antennæ short, conical, whitish, blackish at the tip, arista plumose; thorax with a brown stripe; scutellum whitish; abdomen black; legs whitish, with black bands; wings white, with many blackish spots, some of them confluent; discal transverse vein straight, parted by much less than its length from the border, and by a little less than its length from the præbrachial transverse; halteres whitish. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

146. *TRYPETA SUBOCELLIFERA*, n. s. *Mas.* Cana; antennis albidis; thorace guttis fuscis, scutelli margine albido; abdomine fusco apicem versus cano maculis fuscis; pedibus albidis fusco fasciatis; alis limpidis, maculis nigricantibus pallido signatis ex parte confluentibus.

Male. Hoary. Antennæ whitish, third joint short, conical, arista plumose; thorax with some slight brown dots; scutellum brown, hind borders of the scutellum white; abdomen brown, hind borders of the segments and apical part cinereous, the latter with brown dots; legs whitish, with brown bands; wings limpid, with several blackish

dots containing pale marks, some of them confluent and forming a middle band; discal transverse vein straight, enclosed in a pale streak, parted by much less than its length from the border and by much more than its length from the præbrachial transverse; halteres whitish. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Subfam. ACHIIDES, *Walk.*

Gen. ACHIAS, *Fabr.*

147. *ACHIAS LONGIVIDENS*, n. s. *Mas et Fæm.* Viridi-cinerea; capite testacco fasciis duabus vittisque tribus anticis nigris; antennis nigris; thorace vittis quatuor purpureo-nigris, pectore ferrugineo; abdomine viridi-fulvo; pedibus piceis; alis limpidis, costa lurido-nigricante, vena transversa discali fusco nebulosa; halteribus testaceis apice nigris. *Mas.* Oculis longissime petiolatis, scutello viridi, femoribus basi fulvis. *Fæm.* Oculis subpetiolatis, scutello nigro-purpureo.

Male and Female. Greenish cinereous. Head with two black bands on the vertex and with four black stripes in front; antennæ black, third joint linear, very long, arista plumose; thorax with four purplish black stripes, middle pair abbreviated hindward and having behind them a spot of the same hue, lateral pair interrupted; pectus ferruginous; abdomen tawny, with bright green reflections, testaceous beneath; legs piceous; wings limpid, blackish, and with a lurid tinge along the costa, whence a short oblique blackish streak proceeds by the præbrachial transverse vein; discal transverse vein clouded with brown, hardly curved, parted by less than one-third of its length from the border, and by much more than its length from the præbrachial transverse, which is very oblique; halteres testaceous, with black tips. *Male.* Head with the fore black band interrupted; eyes with very long petioles, the latter about three-fourths of the length of the body; scutellum green; femora tawny towards the base. *Female.* Eyes with short petioles, extending a little beyond the sides of the thorax; scutellum blackish purple. Length of the body 5-6 lines; of the wings 12-13 lines.

148. *ACHIAS LATIVIDENS*, n. s. *Fæm.* Viridi-cinerea; capite testaceo, vittis tribus anticis nigris, oculis subpetiolatis; antennis nigris; thorace vittis quatuor purpureo-nigris, scutello cyaneo basi viridi, pectore fulvo; abdomine viridi-fulvo; pedibus nigris, femoribus basi luteis, tibiis luteo fasciatis; alis subcinereis, vitta costali nigricante interrupta lurida strigata, vena transversa discali fusco nebulosa; halteribus testaceis apice nigris.

Female. Greenish cinereous. Head testaceous, with three black stripes on the face; eyes very slightly petiolated; antennæ black; thorax with four purplish black stripes; scutellum blue, green at the base; pectus tawny; abdomen tawny, with bright green reflections; legs black; femora luteous towards the base; tibiæ with indistinct luteous

bands; wings slightly greenish, with a blackish interrupted costal stripe containing luteous streaks; discal transverse vein clouded with brown; veins in structure like those of the preceding species; halteres testaceous, with black tips. Length of the body 6 lines; of the wings 13 lines.

This species at first sight seems like a variety of the preceding one, but the petioles of the eyes are shorter and thicker, the costal stripes of the wings are interrupted, and the shade on the discal transverse vein is more diffuse.

149. *ACHIAS AMPLIVIDENS*, n. s. *Fœm.* Fulva, subtus testacea; oculis extantibus non petiolatis; thorace submetallico, vittis quinque cinereis; abdomine purpureo basi testaceo, tibiis tarsisque nigris; alis subcinereis, costa nigro-fusca, venis transversis nigro-fusco nebulosis.

Female. Tawny, testaceous beneath. Head testaceous; eyes very prominent, but hardly petiolated; antennæ tawny; thorax slightly metallic, with five cinereous stripes, which are abbreviated hindward, the inner pair slender; abdomen purple, testaceous at the base; legs black; coxæ and femora testaceous, the latter with black tips; wings slightly greyish, costal stripe brown, blackish towards the tip; præbrachial transverse vein clouded with blackish, discal transverse vein clouded with a much paler hue than that of the præbrachial transverse vein, in structure like those of the two preceding species; halteres testaceous, with black tips. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

Subfam. ————— ?

Gen. *POLYARA*, n. g.

Mas. *Corpus* longiusculum. *Caput* transversum; facies lata, plana, non obliqua. *Palpi* lati. *Antennæ* parvæ; articulus tertius longiconicus; arista plumosa. *Thorax* oblongo-subquadratus. *Abdomen* sublineare, thorace multo longius et angustius. *Pedes* breves, tenues. *Alæ* latiusculæ; venæ optime determinatæ; venæ duæ transversæ inter venas radialem et cubitalem; vena præbrachialis apicem versus valde flexa.

Male. Body rather long. Head transverse, a little broader than the thorax; face broad, flat, vertical. Palpi broad. Antennæ small; third joint elongate-conical, not extending more than half the length to the epistoma; arista plumose. Thorax oblong-subquadrate. Abdomen nearly linear, much longer and more slender than the thorax. Legs short, rather slender; fore femora somewhat setose beneath. Wings rather broad, flat in repose; veins very strongly marked; a transverse vein between the cubital and mediastinal veins; two transverse veins between the radial and cubital veins; cubital vein slightly angular between the præbrachial transverse vein and the tip of the wing; præbrachial vein much curved towards its tip.

The structure of the wing veins in this genus is very peculiar, and it does not agree well with any of the established subfamilies of *Muscidæ*.

150. *POLYARA INSOLITA*, n. s. *Mas.* Testacea; faciei sulcis albidis; abdomine lutescente fulvo; alis subcinereis, nigricante-fusco submarginatis et subfasciatis.

Male. Testaceous, paler beneath. Facial grooves for the antennæ whitish; thorax with some almost obsolete stripes, the middle pair approximate, slender, somewhat more distinct than the others; abdomen somewhat lutescent-tawny; wings slightly greyish, irregularly blackish-brown along the costa, brown at the tips, and with a brown band which is indistinct in front but much darker on the discal transverse vein; præbrachial vein largely bordered with brown; veins black, testaceous towards the base, discal transverse vein straight, parted by about one-sixth of its length from the border, and by rather less than half its length from the præbrachial transverse; alulæ very small. Length of the body $5\frac{1}{2}$ lines; of the wings 10 lines.

Subfam. SEPSIDES, *Walk.*

Gen. *ANGITULA*, n. g.

Fæm. *Corpus* convexum, glaberrimum, nitidissimum. *Caput* subrotundum; epistoma valde prominens. *Antennæ* epistoma non attingentes; articulus tertius longiusculus, linearis, apice conicus; arista subpubescens. *Thorax* anticus valde productus et attenuatus; scutellum bispinosum; metathorax magnus, declivis. *Abdomen* longisubfusiforme; segmentum primum gibbosum. *Pedes* longi, graciles; coxæ anticæ longissimæ. *Alæ* longæ, angustæ; alulæ obsoletæ.

Female. Body convex, very smooth and shining. Head nearly round; front subquadrate; face short; epistoma very prominent. Mouth short. Antennæ not reaching the epistoma; third joint linear, rather long, conical at the tip; arista somewhat pubescent. Thorax much produced and attenuated in front; scutellum armed with two spines; metathorax slanting, well developed. Abdomen elongate-subfusiform, longer and much more slender than the thorax; first segment gibbous above. Legs long, slender, without bristles; fore coxæ very long. Wings long, narrow; discal transverse vein straight, upright, parted by less than half its length from the border, and by nearly twice its length from the præbrachial transverse.

151. *ANGITULA LONGICOLLIS*, n. s. *Fæm.* Nigro-ænea; capite subtus albido, frontis disco rufescente, fascia albida; antennis piceis basi rufis; pedibus nigris, femoribus basi coxisque anticis albidis; alis limpidis, costa nigra.

Female. Æneous black. Head whitish beneath, front with a reddish disk, face whitish. Antennæ piceous, first and second joints red;

legs black, bare; femora towards the base and fore coxæ whitish; wings limpid, with a black costal line extending to the tip of the præbrachial vein; veins and halteres black. Length of the body 5 lines; of the wings 8 lines.

Gen. SEPSIS, *Fallen.*

152. SEPSIS BASIFERA, n. s. *Mas et Fæm.* Nigra; thorace nigro-æneo; tarsis, femoribus basi pedibusque anticis testaceis; alis limpidis, costa basi nigra. *Mas.* Metatarsis intermediis dilatatis, alis apice vix nigricantibus. *Fæm.* Alis apice nigris.

Male and Female. Black, shining. Thorax æneous black; pectus cinereous; tarsi, femora at the base, and fore legs, pale testaceous; wings limpid; costa at the base and veins black. *Male.* Basal joint of the intermediate tarsi dilated; wings hardly blackish at the tips. *Female.* Wings black at the tips. Length of the body 2-2½ lines; of the wings 3-3½ lines.

Gen. CALOBATA, *Fabr.*

153. Calobata albitarsis, *Wied. Auss. Zweifl.* 71. 544. 22.
Inhabits also Java and Australia.

154. Calobata indica, *Desv. Ess. Myod.* 737. 4. (Nerius).
Inhabits also Hindostan.

155. Calobata Abana, *Walk. Cat. Dipt.* pt. 4. 1054.

156. CALOBATA SEPSOIDES, n. s. *Fæm.* Nigra; antennis ferrugineis, articulo tertio conico brevi, arista nuda; pedibus testaceis nigricante subnotatis, femoribus anticis nigris basi testaceis, tibiis anticis nigris, tarsis anticis niveis, posticis albidis; alis subcinereis, fasciis duabus indistinctis fusciscentibus.

Female. Black, shining. Antennæ ferruginous, third joint short, conical, arista bare; pectus slightly covered with cinereous tomentum; legs testaceous, with a few very indistinct blackish marks; fore femora black, testaceous towards the base; fore tibiæ black; fore tarsi snow-white, black at the base; hind tarsi whitish; wings greyish, with two almost obsolete brownish bands; discal transverse vein parted by less than its length from the border and by about four times its length from the præbrachial transverse. Length of the body 5 lines; of the wings 7 lines.

Gen. CARDIACEPHALA, *Macq.*

157. CARDIACEPHALA DEBILIS, n. s. *Fæm.* Testacea, gracilis; thorace linea transversa interrupta nigra; pedibus anticis parvis, posterioribus longis, tarsis albis brevissimis, tibiis anterioribus piccis; alis limpidis apice cinereis, fascia lata pallide lutea.

Female. Testaceous, slender. Vertex somewhat luteous; third joint of

the antennæ conical, very short, arista bare; thorax attenuated in front, with a transverse interrupted black line hindward; abdomen longer than the thorax, lanceolate hindward; fore legs short, posterior legs long; tarsi white, very short; anterior tibiæ piceous; middle femora rather thicker than the hind pair; wings limpid, grey towards the tips, with a pale luteous middle band; veins testaceous, cubital and præbrachial converging towards the tips of the wings, discal transverse vein straight, parted by less than its length from the border and by about thrice its length from the præbrachial transverse. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

Subfam. PSILIDES, *Walk.*

Gen. LISSA, *Meigen.*

158. LISSA CYLINDRICA, n. s. *Mas.* Cyanea, gracilis, cylindrica; antennis piceis basi albidis, arista plumosa; abdomine piceo basi apiceque cyaneis; pedibus albidis, femoribus posterioribus nigris apice albidis, femoribus posticis subtus spinosis, tibiis posticis nigris; alis subcinereis apice subfuscis; halteribus albidis apice nigris.

Male. Blue, slender, cylindrical. Head broader than the thorax; antennæ whitish, third joint piceous, arista plumose; abdomen piceous, slightly increasing in breadth to the tip, blue at the base and at the tip, hind borders of the first and second segments whitish; legs whitish, posterior femora black, whitish at the base and towards the tips, hind femora spinose beneath, hind tibiæ black; wings slightly greyish, brownish towards the tips; veins black, præbrachial and perbrachial very near together for more than half their length, discal transverse vein straight, parted by more than its length, and by about four times its length from the præbrachial transverse; halteres whitish, with black tips. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

Gen. NERIUS, *Fabr.*

159. NERIUS duplicatus, *Wied. Auss. Zweifl.* 11. 553. 8.
Inhabits also Java.

Subfam. OSCINIDES, *Haliday.*

Gen. OSCINIS, *Fabr.*

160. OSCINIS LINEIPLENA, n. s. *Mas.* Fusca; capite subtus testaceo apud oculos albo, vitta frontali alba; thorace pectoreque lineis sex albidis; abdomine sordide testaceo, pedibus albidis, tibiis tarsisque apice femoribusque anticis nigris; alis subcinereis, halteribus albidis.

Male. Brown. Head testaceous in front and beneath, white about the eyes, with a white stripe on the front; thorax and pectus with six whitish stripes on each, thorax with an indistinct middle testaceous

stripe; abdomen dull testaceous; legs whitish; tibiæ and tarsi at the tips and fore femora black; wings greyish; veins black, discal transverse vein oblique, parted by more than its length from the border, and by full twice its length from the præbrachial transverse; halteres whitish. Length of the body 2 lines; of the wings 3 lines.

161. *OSCINIS NOCTILUX*, n. s. *Mas.* Atra; capite pallide flavo subtus albo; antennis luteis, arista nuda; scutello, maculis duabus pectoralibus abdominisque apice albis; tibiis tarsisque intermediis testaceis; alis nigricantibus postice cinereis, halteribus niveis.

Male. Black. Head pale yellow, black hindward, white beneath; antennæ pale luteous, third joint very short, arista bare; scutellum white; pectus with a white spot on each side; abdomen white at the tip; middle legs with testaceous tibiæ and tarsi; hind wings blackish, cinereous hindward; halteres snow-white. Length of the body $\frac{3}{4}$ line; of the wings $1\frac{1}{2}$ line.

Subfam. GEOMYZIDES, *Fallen.*

Gen. DROSOPHILA, *Fallen.*

162. *DROSOPHILA*? *FINIGUTTA*, n. s. *Mas.* Fulva; capite antice testaceo, antennis testaceis, articulo tertio conico; abdomine maculis quatuor apicalibus nigris, tarsis nigris; alis cinereis venis nigris.

Male. Tawny. Head testaceous in front; antennæ testaceous, third joint conical; abdomen with two black spots on each side at the tip; legs testaceous; tarsi black; wings grey; veins black, discal transverse vein straight, parted by full half its length from the border and by full twice its length from the præbrachial transverse; halteres testaceous. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

163. *DROSOPHILA*? *MELANOSPILA*. *Fæm.* Testacea; antennarum articulo tertio conico, arista plumosa; thoracis disco abdominisque guttis duabus apicalibus atris; tarsis piceis; alis subcinereis.

Female. Testaceous. Vertex luteous; third joint of the antennæ conical; arista plumose; disk of the thorax and a dot on each side of the tip of the abdomen deep black; tarsi piceous; wings slightly greyish; veins black, discal transverse vein straight, parted by about half its length from the border and by twice its length from the præbrachial transverse. Length of the body 1 line; of the wings 2 lines.

164. *DROSOPHILA*? *IMPARATA*. *Fæm.* Pallide testacea; pedibus pallidioribus; alis subcinereis, venis pallidis.

Female. Pale testaceous, with a few bristles. Legs paler than the body; wings slightly greyish; veins pale, discal transverse vein straight, parted by about twice its length from the border and by more than twice its length from the præbrachial transverse. Length of the body $\frac{3}{4}$ line; of the wings $1\frac{1}{2}$ line.

Subfam. HYDROMYZIDES, *Haliday*.Gen. EPHYDRA, *Fallen*.

165. EPHYDRA? TACITURNA, n. s. *Fæm.* Atra, nitens, antennis nigris, arista plumosa, abdomine nigro-cupreo, pedibus nigro-piceis, alis nigricantibus, venis nigris.

Female. Deep black, shining. Antennæ black, third joint linear, rather long, arista plumose; legs blackish-piceous; wings blackish; veins black, discal transverse vein straight, parted by a little more than its length from the border. Length of the body $1\frac{1}{2}$ line; of the wings $2\frac{1}{2}$ lines.

Fam. PHORIDÆ, *Haliday*.

Gen. PALLURA, n. g.

Mas. Corpus latiusculum, pubescens. Os retractum. Oculi pubescentes. Antennæ brevissimæ; arista longissima. Scutellum magnum, conicum. Abdomen subellipticum, thorace non longius. Pedes latiusculi, pubescentes, non setosi. Alæ amplæ, venis æqualibus.

Male. Body rather broad, pubescent. Proboscis small, withdrawn; eyes pubescent; antennæ very short, arista very long; scutellum large, conical, very prominent, extending beyond the base of the abdomen; abdomen nearly elliptical, not longer than the thorax; legs rather broad, pubescent, without bristles; wings rather long and broad; veins of equal size, costal vein ending at rather before half the length of the wing, radial ending at somewhat in front of the tip of the wing, cubital ending at hardly in front of the tip, præbrachial ending at a little behind the tip, pabrachial ending on the hind border at half the length of the wing, discal transverse vein straight, parted by more than twice its length from the border and from the præbrachial transverse.

166. PALLURA INVARIA. *Mas.* Lutea, immaculata, alis cinereis basi luteis, apice nigricantibus, venis nigris robustis.

Male. Luteous, of one colour. Wings grey, luteous at the base, blackish towards the tips; veins black, robust. Length of the body 3 lines; of the wings 6 lines.

Fam. HIPPOBOSCIDÆ, *Leach*.Gen. ORNITHOMYIA, *Leach*.

167. Ornithomyia parva?, *Macq. Hist. Nat. Dipt.* 11. 2. 279. 3.

KEY ISLAND.

Fam. ASILIDÆ, *Leach*.Subfam. LAPHRITES, *Walk*.Gen. LAPHRIA, *Fabr*.

1. *LAPHRIA PARADISIACA*, n. s. *Mas*. Cuprea, aureo pilosa, capite pectoreque argenteis albo pilosis, mystace subaurato setis nonnullis nigris, abdomine apice purpureo subtus albido piloso, pedibus cyaneo-purpureis albido pilosis, femoribus cyaneo-viridibus, alis nigricantibus basi cinereis, halteribus albidis nigro notatis.

Male. Cupreous, with gilded hairs. Head and pectus silvery, with white hairs; mystax slightly gilded, with a few long black bristles; antennæ and mouth black; abdomen purple at the tip, underside clothed with long whitish hairs, silvery white at the base, the following segments bordered with silvery white; legs blue and purple, thickly clothed with long whitish hairs, femora bluish-green, fore tibiæ with pale gilded down beneath, hind tibiæ with a black bristly apical tuft beneath; wings blackish, grey towards the base; halteres whitish, marked with black. Length of the body 11 lines; of the wings 20 lines.

2. *LAPHRIA PLACENS*, n. s. *Mas*. Cyanea, capite aurato, mystace setis paucis longis nigris; antennis nigris, articulo tertio fusiformi; pectore albido, abdomine angusto, femoribus intus tibiisque purpureis; alis nigricantibus basi cinereis, halteribus piceis.

Male. Blue. Head gilded in front, whitish behind; mystax with a few long black bristles; proboscis and antennæ black, third joint of the latter fusiform; pectus whitish; abdomen cylindrical, much narrower than the thorax, and about twice its length; femora on the inner side and tibiæ purple, tarsi black; wings blackish, cinereous towards the base; halteres piceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Subfam. ASILITES, *Walk*.Gen. ASILUS, *Linn*.

3. *ASILUS SUPERVENIENS*, n. s. *Mas*. Cinereus, capite subaurato, mystace aurato setis paucis nigris, thorace vittis tribus latissimis nigris, abdomine fulvescenti-cinereo, pedibus rufescentibus, femoribus nigro vittatis, tarsis nigris, alis cinereis apice nigricantibus, halteribus testaceis.

Male. Cinereous. Head slightly gilded, pale cinereous, and clothed with pale hairs behind; mystax composed of gilded bristles, above which there are a few shorter black bristles; antennæ black, third joint elongate-fusiform, arista much longer than the third joint; thorax with three very broad hardly divided black stripes; abdomen

with a slight fawn-coloured tinge, tip black, sexualia very small; legs reddish, femora striped above with black, tarsi black, reddish at the base; wings cinereous, blackish towards the tips; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

Gen. *OMMATIUS*, *Illiger*.

4. *Ommatius noctifer*, *Walk*. See page 88.

Fam. *EMPIDÆ*, *Leach*.

Gen. *HYBOS*, *Fabr*.

5. *HYBOS DEFICIENS*, n. s. *Mas*. Niger, thorace fulvo globoso macula dorsali nigra, abdomine basi fulvo, pedibus anterioribus testaceis, femoribus posticis subtus spinosis, alis cinereis apice obscurioribus, stigmate venisque nigris, halteribus testaceis, apice piceis.

Male. Black. Thorax and pectus tawny, the former globose, with a black dorsal spot; abdomen tawny at the base; anterior legs testaceous, hind femora spinose beneath; wings grey, darker at the tips; stigma and veins black; halteres testaceous, with piceous tips. Length of the body 2 lines; of the wings 4 lines.

Fam. *SYRPHIDÆ*, *Leach*.

Gen. *ERISTALIS*, *Latr*.

6. *Eristalis resolutus*, *Walk*. See p. 95.

Gen. *BACCHA*, *Fabr*.

7. *BACCHA PURPURICOLA*, n. s. *Fem*. Purpureo-fulva; capite chalybeo; antennis rufis; pedibus fulvis; tibiis posticis apice tarsisque posticis basi piceis; alis nigricantibus, apud costam obscurioribus, spatio apicali subcostali cinereo; halteribus testaceis.

Female. Tawny, tinged with purple. Head chalybeous; antennæ red; legs tawny, hind tibiæ piceous towards the tips, hind tarsi piceous towards the base; wings blackish, darker along the costa, cinereous towards the tips with the exception of the costa; halteres testaceous. Length of the body $5\frac{1}{2}$ lines; of the wings 9 lines.

Fam. *MUSCIDÆ*, *Latr*.

Subfam. *SARCOPHAGIDES*, *Walk*.

Gen. *SARCOPHAGA*, *Meigen*.

8. *SARCOPHAGA BASALIS*, n. s. *Mas*. Nigra, subaureo tomentosa; capite aurato; thorace vittis tribus nigris; abdomine albido tessellato; alis cinereis; venis lurido marginatis; alulis testaceis.

Male. Black, with slightly gilded tomentum. Head gilded; frontalia deep black, hardly widening in front; thorax with three black stripes, an indistinct blackish line on each side of the middle stripe; abdomen tessellated with white; wings grey; veins bordered with a lurid hue, especially towards the costa; præbrachial vein forming a slightly acute angle at its flexure, near which it is much curved inward, and is thence straight to its tip; discal transverse vein slightly curved inward near its hind end, parted by a little more than half its length from the border and from the præbrachial transverse; alulæ testaceous. Length of the body $5\frac{1}{2}$ lines; of the wings 9 lines.

Subfam. MUSCIDES, *Walk.*

Gen. IDIA, *Meigen.*

9. *Idia xanthogaster*, *Wied. Auss. Zweifl.* 11. 349. 2.

Inhabits also Hindostan and Java.

10. *Idia testacea*, *Macq. Hist. Nat. Dipt.* 77. 246. 3.

Inhabits also Mauritius.

Gen. MUSCA, *Linn.*

11. *Musca obtrusa*, *Walk.* See p. 105.

Subfam. ANTHOMYIDES, *Walk.*

Gen. ARICIA, *Macq.*

12. *ARICIA VICARIA*, n. s. *Fam.* Fulva, subtus testacea; capite nigro, apud oculos albo; antennis testaceis; alis cinereis, apud costam luridis.

Female. Tawny, testaceous beneath. Head black, white about the eyes; antennæ testaceous; abdomen clothed with short black bristles; legs testaceous, tarsi piceous; wings grey, with a lurid tinge towards the costa; veins black, discal transverse vein nearly straight, parted by about its length from the border, and by a little more than its length from the præbrachial transverse; alulæ slightly testaceous; halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

13. *ARICIA SQUALENS*, n. s. *Fam.* Nigra, cinereo tomentosa; facie argentea; antennis testaceis; thorace vittis nigris vittisque duabus lateralibus latis testaceis; abdomine obscure testaceo; pedibus piceis; femoribus nigris; tibiis anticis testaceis; alis cinereis; apud costam subluridis; venis halteribusque testaceis.

Female. Black, with cinereous tomentum. Face silvery white; antennæ pale testaceous, third joint long, linear, extending to the epistoma; thorax with black stripes, and on each side with a broad testaceous stripe; abdomen dull testaceous; legs piceous; femora black, fore tibiæ testaceous; wings grey, with a lurid tinge towards

the costa; veins testaceous, discal transverse vein very slightly curved inward, parted by much less than its length from the border, and by a little more than its length from the præbrachial transverse; alulae whitish; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Subfam. ORTALIDES, *Haliday*.

Gen. LAMPROGASTER, *Macq.*

14. LAMPROGASTER VENTRALIS, n. s. *Fæm.* Testaceo-cinerea; capite apud oculos albo, vertice luteo, facie pallide fulva; thorace lineis septem indistinctis nigricantibus; abdomine fusco maculis dorsalibus canis, subtus cavo lateribus ferrugineis; pedibus nigris, tibiis ferrugineo fasciatis; alis limpidis basi subtestaceis, fasciis incompletis guttisque fuscis apud costam nigricantibus.

Female. Cinereous, with a testaceous tinge. Head white about the eyes, vertex luteous; face pale tawny, with white grooves for the antennæ; antennæ tawny, small; arista slightly plumose at the base; thorax with seven indistinct blackish lines; abdomen brown, with dorsal hoary nearly triangular spots, under side marsupial-like or with a pouch, ferruginous on each side; legs black, each tibia with a ferruginous band; wings limpid, slightly testaceous at the base, with brown dots and bands, the latter abbreviated hindward, blackish towards the costa; veins black, testaceous towards the base; discal transverse vein straight, parted by about one-third of its length from the border and by much more than its length from the præbrachial transverse; alulae cinereous; halteres testaceous. Length of the body 5 lines; of the wings 10 lines.

Gen. TRYPETA, *Meigen*.

15. TRYPETA RORIPENNIS, n. s. *Fæm.* Fusca; capite nigro, facie alba; antennis nigris rufo-fasciatis; thorace vittis quatuor canis; abdominis segmentis testaceo marginatis; pedibus nigris, tarsis halteribusque testaceis; alis nigris, punctis plurimis albis.

Female. Brown. Head black; face white; antennæ black, third joint red, linear, rather long, black towards the tip; arista plumose; thorax with four hoary stripes; abdominal segments with testaceous hind borders; legs black, tarsi testaceous; wings black, with very numerous white points, a few of which are rather larger than the others; discal transverse vein straight, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse; halteres testaceous. Length of the body 2 lines; of the wings 4 lines.

Catalogue of Hymenopterous Insects collected by Mr. A. R. WALLACE at the Islands of Aru and Key. By FREDERICK SMITH, Esq., Assistant in the Zoological Department, British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., V.P.L.S.

[Read December 3rd, 1858.]

THIS Collection of Hymenoptera is the most important contribution which has been made to the Aculeata through the exertions of Mr. Wallace; in point of geographical distribution, it adds much to our knowledge. In the Aru, Key, and neighbouring islands, we meet with the extreme range of the Australian insect-fauna; and as might be expected, it is found amongst the Vespidae Group, and in one or two instances in the Formicidae. The latter, being frequently conveyed from one island to another, can perhaps scarcely be considered indicative of natural geographical distribution. Of the forty-six species of the Formicidous Group, only six were previously known to science. Of the genus *Podomyrma* here established, one species only, from Adelaide, was previously known; it is one of the most distinct and remarkable genera in the family. The *Pompilidæ* are species of great beauty, some closely resembling those of Australia in the banding and maculation of their wings; amongst the *Vespidæ* will be found some of the most elegant and beautiful forms in the whole of that protean family of Hymenoptera.

Fam. ANDRENIDÆ.

Gen. PROSOPIS.

1. *PROSOPIS MALACHISIS*. *P. nigro-cæruleo-viridis*, nitida et delicatè punctata; alis hyalinis.

Female. Length $4\frac{1}{2}$ lines. Deep blue-green. with tints of purple in certain lights, particularly on the head, the clypeus with a central longitudinal ridge, its anterior margin slightly emarginate; the flagellum rufo-piceous beneath, the ocelli white. Thorax: the wings hyaline and brilliantly iridescent; the legs dark rufo-piceous with a bright purple tinge. Abdomen delicately punctured, the head and thorax more strongly so; the latter with a semicircular enclosed space at its base, which is smooth and shining.

Hab. Key Island.

Gen. NOMIA.

1. *NOMIA CINCTA*. *N. nigra*, capite thoraceque punctatis, pedibus ferrugineis; segmentis abdominis apice fulvo-testaceo late fasciatis.

Female. Length 5 lines. Black: the two basal joints of the flagellum,

the apical margin of the clypeus, the labrum, mandibles, and legs ferruginous; the wings fulvo-hyaline, the nervures ferruginous, the tegulæ more or less rufo-testaceous; the sides of the metathorax with tufts of pale fulvous pubescence and the floccus on the posterior femora of the same colour, the tibiæ and tarsi with short ferruginous pubescence. Abdomen shining, the apical margins of the segments broadly fulvo-testaceous, very bright, having a golden lustre.

Hab. Key Island.

2. *NOMIA LONGICORNIS*. *N. nigra*, lucida et delicatulè punctata, facie pube brevi griseâ tectâ, femorum posticorum flocco pallido, tibiis externè fusco-pubescentibus; maris antennis, capite thoraceque longioribus.

Male. Length 4 lines. Brassy, with tints of green on the clypeus, metathorax, and thorax beneath; the head and thorax very closely and finely punctured; the clypeus produced and highly polished; the mandibles rufo-testaceous, the antennæ as long as the head and thorax. Thorax: the wings hyaline and splendidly iridescent, the tegulæ and the tarsi rufo-testaceous. Abdomen closely punctured, the apical margins of the segments smooth and shining; the head and thorax above with a pale fulvous pubescence, that on the sides of the metathorax and legs pale and glittering; the abdomen has a pale scattered glittering pubescence.

Hab. Aru.

3. *NOMIA DENTATA*. *N. nigra* et punctata, facie metathoracisque lateribus cinereo-pubescentibus, postscutello medio unidentato. *Mus.* antennis filiformibus longitudine thoracis.

Female. Length 5 lines. Black; head and thorax rather finely punctured; the face covered with short cinereous pubescence; the clypeus naked and much produced, the anterior margin and the tips of the mandibles ferruginous; the cheek with long whitish pubescence. Thorax: the sides of the metathorax, the floccus on the posterior femora and the postscutellum with whitish pubescence, the latter produced in the middle into a blunt tooth; the legs fusco-ferruginous, with the anterior tibiæ and apical joints of the tarsi brighter; wings hyaline and iridescent. Abdomen shining and punctured, the apical margins of the two basal segments broadly depressed, and more finely and closely punctured than the rest; the apical margins of the second, third, and fourth segments pale testaceous; the apical margins of the two basal segments narrowly fringed with white pubescence, usually more or less interrupted in the middle.

Male. Resembles the female very closely, but has the face much more pubescent; the antennæ filiform and longer than the head and thorax; the scutellum armed at its posterior lateral angles with an acute tooth; the metathorax truncate and slightly concave, its base with short longitudinal grooves, the lateral margins fringed with long pubescence.

Hab. Aru.

Subfam. DASYGASTRÆ.

Gen. MEGACHILE, *Latr.*

1. MEGACHILE LATERITIA. *M. nigra*, abdomine pube ferrugineâ vestito, alis fuscis.

Female. Length 8 lines. Black; head and thorax very closely and finely punctured; the mandibles with a single blunt tooth at their apex; the anterior margin of the clypeus transverse. Thorax: the wings brown, the posterior pair palest, their base subhyaline. Abdomen clothed with bright brick-red pubescence above and beneath; the basal segment with bright yellow pubescence above.

Hab. Aru.

2. MEGACHILE SCABROSA. *M. nigra*, metathorace anticè rudè scabrato, abdomine subtùs nigro-pubescente.

Female. Length $5\frac{1}{2}$ lines. Black; the clypeus, mesothorax anteriorly, and the posterior tibiæ outside coarsely rugose, the roughness on the thorax consisting of transverse little elevated points; the face with a thin griseous pubescence; the anterior margin of the clypeus fringed with fulvous hairs; the cheeks have a long pale fulvous pubescence. Thorax: the wings hyaline, the nervures black. Abdomen smooth and shining, with black pubescence beneath; beneath, the apical margins of the segments with a fringe of very short white pubescence.

Hab. Aru.

3. MEGACHILE INSULARIS. *M. nigra*, nitida, delicatulè punctata, facie pube pallidè fulvâ vestitâ, abdomine subtùs pube latè ferrugineâ vestito, alis hyalinis.

Female. Length $5\frac{1}{2}$ lines. Black; the head and thorax finely and closely punctured, the abdomen delicately so; the face clothed with pale fulvous pubescence, the mandibles with two blunt teeth at their apex; the clypeus shining and strongly punctured. Thorax: the wings subhyaline with a slight cloud at their apex; the basal joint of the posterior tarsi with a dense dark ferruginous pubescence within. Abdomen: the four basal segments with transverse impressed lines in the middle; beneath, clothed with bright ferruginous pubescence; the abdomen has an obscure æneous tinge above.

Hab. Aru.

Gen. CROCISA, *Jurine.*

1. *Crocisa nitidula*, *Fabr. Syst. Piez.* p. 386. 2.

Hab. Aru; Key Island; Australia; Amboyna.

Gen. ALLODAPE, *St.-Farg.*

1. ALLODAPE NITIDA. *A. nitida nigra*, clypeo flavo, alis hyalinis, abdomine ad apicem punctato.

Female. Length 3 lines. Black and shining; the clypeus yellow, pro-

duced in front; the sides of the face depressed; the ocelli prominent and reddish. Thorax very smooth and shining; the wings colourless and iridescent, their extreme base yellowish, the nervures and stigma brown, the tegulæ pale testaceous-yellow; the posterior tibiæ with a scopa of glittering white hairs, the tarsi ferruginous and with glittering hairs. Abdomen, from the third segment to the apex, gradually more and more strongly and closely punctured.

Hab. Aru.

Gen. XYLOCOPA, *Latr.*

1. *Xylocopa æstuans*, *Linn. Syst. Nat.* i. p. 961. 53 ♀; *St.-Farg. Hym.* ii. p. 193. 36 ♂ ♀.

Hab. Aru; India; Singapore; Celebes.

Gen. SAROPODA, *Latr.*

1. *Saropoda bombiformis*, *Smith, Cat. Hym. Ins.* pt. 2. p. 318. 6.

Hab. Aru; Australia (Richmond River).

Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*, *Linn. Syst. Nat.*

Hab. Aru Island; Celebes; Ceylon; India; Borneo; Hong-Kong; Shanghai; Philippine Islands.

2. *ANTHOPHORA ELEGANS.* *A. nigra*, pube capitis thoracisque nigrâ, abdomine fasciis quatuor lætè cæruleis ornato; tibiis posticis ferrugineo-pubescentibus.

Female. Length 6 lines. Black; the labrum, a narrow line down the middle and another on each side of the clypeus, a minute spot above it, and the scape in front testaceous yellow, the base of the mandibles of a paler colour; the flagellum fulvous beneath. Thorax: the pubescence black; wings subhyaline, the nervures dark rufous, tegulæ obscurely testaceous. Abdomen with four fasciæ of brilliant blue, which is changeable, with pearly tints in different lights; the posterior tibiæ densely clothed outside with fulvo-ferruginous pubescence; the pubescence inside is black.

Hab. Key Island.

Gen. TRIGONA, *Jurine.*

1. *Trigona læviceps*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc.* ii. p. 51. 8.

Hab. Aru; Singapore; India.

Fam. FORMICIDÆ.

Gen. FORMICA.

1. *Formica virescens*, *Fabr. Ent. Syst.* ii. p. 355. 23 ♂ ♀.—*Lasius virescens*, *Fabr. Syst. Piez.* p. 417. 8.

2. *Formica gracilipes*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc.* ii. p. 55. 13 ♂.

3. *FORMICA FRAGILIS*. *F. pallidè testacea*, elongata et gracilis, capite posticè angustato; thorace medio compresso, pedibus elongatis; squamâ incrassatâ triangulatâ.

Worker. Length $3\frac{1}{2}$ lines. Pale rufo-testaceous, smooth and slightly shining; antennæ elongate, longer than the body, the flagellum slender and filiform, the scape nearly as long as the head and thorax; head oblong, narrowed behind the eyes into a kind of neck, the sides parallel before the eyes, which are black and round, the clypeus slightly emarginate anteriorly, the mandibles finely serrated on their inner margin and terminating in a bent acute tooth. Thorax elongate, narrowest in the middle, the prothorax forming a neck anteriorly; legs elongate and very slender. Abdomen ovate, the node of the petiole incrassate, and viewed sideways is triangular or wedge-shaped.

Hab. Aru.

This is one of those remarkable forms which recede so greatly from the normal type of *Formica* as apparently to indicate a generic distinction; but in those exotic species of which we have obtained all the forms, we find many which approach closely to the present insect, which is probably only the small worker of some already described species. No one would venture, without the authority of the personal observation of some competent naturalist, to unite all the forms of any exotic species of *Formica*.

4. *FORMICA FLAVITARSUS*. *F. nigra*, elongata et gracilis; thorace posticè compresso, pedibus elongatis, tarsis flavis.

Worker. Length 4 lines. Black and sub-opake; head elongate, narrowed behind, the clypeus truncate anteriorly, the mandibles pale ferruginous; antennæ elongate and slender, the flagellum filiform and pale rufo-testaceous; the thorax and legs elongate, the latter slender with their tarsi pale rufo-testaceous. Abdomen ovate, the scale of the petiole incrassate and slightly notched above.

Hab. Aru.

5. *FORMICA COXALIS*. *F. nigra*, nitida; flagello, coxis et abdomine subtùs pallidè testaceis.

Worker major. Length 5 lines. Black and very delicately roughened with a fine transverse waved striation only perceptible under a good magnifying power. Head large, much wider than the thorax, oblong-ovate with a deep emargination behind; the clypeus slightly produced and truncate anteriorly, the angles of the truncation rounded, and with a central shining carina; the flagellum, except the tarsal joint, pale rufo-testaceous. Thorax elongate, compressed behind, the coxæ pale rufo-testaceous. Abdomen ovate, the scale of the petiole incrassate, somewhat wedge-shaped when viewed sideways, the abdomen sparingly sprinkled with long pale hairs.

6. *FORMICA CORDATA*. *F. pallidè rufa*; abdomine fusco, capite cordato.

Worker. Length 2 lines. Pale rufo-testaceous; the head heart-shaped; the eyes black, the flagellum fusco-ferruginous with the basal joints pale; the mandibles ferruginous. Thorax narrow, deeply strangled at the base of the metathorax. Abdomen more or less fuscous, the node of the petiole narrow and pointed above; the entire insect is smooth and shining.

Hab. Aru.

The *worker minor* is rather smaller and has the abdomen darker, in all the specimens received, but in other respects agrees with the above.

7. *FORMICA OCULATA*. *F. pallidè ferruginea*; capite oblongo, oculis magnis, thorace compresso.

Worker. Length $2\frac{1}{2}$ lines. Pale ferruginous, with the vertex and apex of the abdomen black; the head oblong, the sides nearly parallel, with the anterior margin truncate; the mandibles with fine acute teeth on their inner margin; the antennæ inserted wide apart about the middle of the head; the eyes very large and ovate, placed backwards on the sides of the head, reaching to the posterior margin of the vertex, forming as it were its posterior lateral angles. The thorax narrow and compressed behind; abdomen ovate, entirely smooth and shining.

Hab. Aru.

8. *FORMICA MUTILATA*. *F. nigra*; capite oblongo, truncato anticè et sanguineo, antennis tarsisque rufo-testaceis.

Worker. Length $2\frac{3}{4}$ lines. Black and shining; the head truncate anteriorly, the antennæ inserted wide apart, about the middle, the face blood-red before their insertion and deeply striated longitudinally, behind the antennæ the head is black, smooth, and shining; the eyes ovate and placed backwards on the sides of the head. Thorax rounded in front and strangled between the meso- and metathorax, the latter obliquely truncate; legs rather short and stout, the femora compressed, the anterior pair broadly dilated, the base and apex of the femora, the tibiæ, and tarsi rufo-testaceous, the tibiæ with a darker stain behind. Abdomen oblong-ovate, the apical margins of the segments narrowly pale testaceous; the scale of the petiole compressed, with its superior margin rounded.

Hab. Aru.

This is a very singular insect in many respects, and closely resembles in form the *Formica truncata* of Spinola.

9. *FORMICA QUADRICEPS*. *F. nigra, nitida*; capite anticè oblique truncato, thorace posticè compresso.

Worker. Length $3\frac{1}{2}$ lines. Shining black; head oblong-quadrate, slightly narrowed anteriorly, with the sides nearly straight, the posterior angles rounded, and very slightly emarginate behind; the head obliquely truncate from the base of the clypeus; the truncation as

well as the mandibles obscurely ferruginous; the apex of the flagellum and the apical joints of the tarsi pale rufo-testaceous. Thorax rounded anteriorly, compressed behind, with the metathorax abruptly truncate. The scale of the petiole narrow, incrassate, its anterior margin slightly curved, its posterior margin straight; the abdomen ovate.

Worker minor. About 3 lines long, very like the larger *worker*, the head being truncate in front; but it is, in proportion to the thorax, narrower; the latter is compressed and abruptly truncate; in other respects it agrees with the *worker major*.

Hab. Aru.

10. *FORMICA LÆVISSIMA.* *F. nigra nitida lævissima*, sparsè pilosa; squamâ oblongâ subdepressâ.

Worker. Length 4 lines. Jet-black, very smooth and shining; head wider than the thorax, slightly emarginate behind, the sides slightly rounded; the anterior margin of the clypeus rounded, the mandibles striated and obscurely ferruginous; the scape with a few glittering silvery-white hairs. Thorax not quite so wide as the head anteriorly, narrowed behind, with the disk somewhat flattened, slightly convex, a deep strangulation between the meso- and metathorax, the latter obliquely rounded; the legs and abdomen sprinkled with glittering white hairs. The node of the petiole incrassate, very slightly elevated; viewed sideways, broadly wedge-shaped; the abdomen ovate.

Hab. Aru.

11. *FORMICA NITIDA.* *F. capite abdomineque nigris, antennis thoracæque pedibusque rufo-testaceis lævissimis et lucidis.*

Worker. Length 4 lines. Head and abdomen shining black; the flagellum, thorax, legs, and scale of the petiole rufo-testaceous; the legs palest; the scape fuscous, with its base pale; the head large, wider than the abdomen, and emarginate behind; the clypeus and mandibles obscurely ferruginous. Thorax compressed, not strangulated in the middle. The scale of the petiole narrow, with its margin rounded above; abdomen ovate, and sprinkled with a few erect pale hairs.

Hab. Aru.

12. *FORMICA SCRUTATOR.* *F. nigerrima, mandibulis tarsorumque articulo apicali pallidè ferrugineis, thorace medio profundè coarctato.*

Worker. Length $1\frac{1}{2}$ –2 lines. Shining black; the mandibles pale, ferruginous, with their inner margins finely denticulate; the eyes placed rather forwards on the sides of the head, the latter emarginate behind. Thorax deeply strangulated in the middle; the metathorax elevated and obliquely truncate behind. Abdomen ovate; the scale of the petiole sub-incrassate, with its margin rounded above; the insect very thinly covered with a fine cinereous pile.

Hab. Aru.

13. *FORMICA ANGULATA*. *F. nigra nitida*; flagello capite anticè pedibusque obscurè ferrugineis, metathorace angulato.

Worker. Length 3 lines. Shining black; head of moderate size; the clypeus and mandibles obscure ferruginous; the flagellum fusco-ferruginous, with the tip pale testaceous. Thorax rounded anteriorly and compressed behind; the scutellum prominent, forming a small tubercle; the metathorax obliquely truncate, the margin of the truncation elevated, so that when viewed sideways the metathorax forms an obtuse angular shape. Abdomen ovate, the node of the peduncle elevated, incrassate, rounded anteriorly, and flat behind.

Hab. Aru.

Gen. *POLYRHACHIS*, *Smith*.

1. *Formica sericata*, *Guér. Voy. Coq. Zool.* ii. 203; *Atlas Ins.* pl. 8. f. 2, 2 a, b, c, d, ♀. (*Polyrhachis sericata*, *Smith, Append. Cat. Form.* p. 200.)

Hab. Aru; New Hebrides.

2. *Formica sexspinosa*, *Latr. Hist. Nat. Fourm.* p. 126, pl. iv. f. 21 ♀. (*Polyrhachis sexspinosa*, *Smith, Cat. Form.* p. 56. 3.)

Hab. Aru; India; Philippine Islands.

3. *POLYRHACHIS MARGINATUS*. *P. niger*; antennis, palpis pedibusque ferrugineis; thoracis marginibus recurvis, metathorace petiolique squamulâ bidentatis.

Worker. Length $2\frac{1}{2}$ lines. Black; the antennæ and legs ferruginous; the head and thorax rugose; the prothorax transverse, its anterior margin slightly curved, with the lateral angles produced forwards and very acute; the thorax narrowed to the metathorax, which is armed with two divergent acute spines. Abdomen velvety black and globose; the scale of the petiole produced laterally into long, bent, acute spines, which curve backwards to the shape of the abdomen.

Hab. Aru.

4. *POLYRHACHIS HOSTILIS*. *P. niger*, longitudinaliter striatus, thoracis marginibus expansis, metathorace squamulâque petioli spinis duabus crassis acutis curvatis.

Worker. Length 3 lines. Black; the head and thorax longitudinally striated, the abdomen very finely and evenly so; the prothorax transverse, wider than the head, the anterior and lateral margins recurved, the latter acute at their anterior angles, and rounded at the posterior ones; the lateral margins of the mesothorax recurved, a deep notch between the meso- and metathorax; the latter with a long, stout, curved, acute spine on each side. The scale of the petiole produced above on each side, into a long, curved, stout, acute spine, which curves backwards round the sides of the abdomen.

Hab. Aru.

5. *POLYRHACHIS LONGIPES*. *P. niger*; flagelli dimidio apicali tibisque anticis pallidè ferrugineis, prothorace petiolique squamulâ bidentatis.

Worker. Length 3 lines. Black; the head and thorax finely rugose; the antennæ elongate, longer than the insect; the apical half of the flagellum pale ferruginous. Thorax rounded above, the sides not margined; two spines on the thorax anteriorly, two on the metathorax, and two on the scale of the petiole; the legs elongate, with the anterior tibiæ ferruginous. Abdomen globose, sometimes rufo-fuscous, or the base obscurely rufous.

Hab. Aru.

6. *POLYRHACHIS SERRATUS*. *P. niger*; capite thoraceque rugosis, abdomine densè punctato, squamâ petioli transversâ, margine superno serratâ.

Worker. Length 2 lines. Black, with the antennæ and legs ferruginous. Thorax oblong-quadrate or very slightly narrowed towards the metathorax, slightly convex above, not margined at the sides, the divisions not perceptible; the head and thorax rugose and pubescent. Abdomen globose, shining, and closely punctured; the scale of the petiole transverse above, produced into an acute spine on each side, the upper margin finely serrated, the lateral margins narrowed to their base, and having two or three small sharp spines.

Hab. Aru.

7. *POLYRHACHIS SCUTULATUS*. *P. niger*, fortiter politus et lucidus, metathorace petiolique squamulâ dente longo curvato acuto in latere utroque, pedibus nigro-ferrugineis.

Worker. Length $2\frac{3}{4}$ lines. Black and very smooth and shining; the legs dark ferruginous. Thorax: the disk expanded, slightly convex above, with the margins acute and curving upwards; the anterior margin transverse, rather wider than the head, with the lateral angles slightly curved forwards, and very acute; the lateral margins of the prothorax curved backwards and inwards; the margins of the mesothorax are rounded; the pro- and mesothorax highly polished above, forming an escutcheon-shaped disk; the metathorax opaque, and sprinkled with a few short glittering hairs, armed posteriorly with two long very acute spines, divergent and directed backwards. Abdomen globose; the scale of the petiole with two long curved acute spines, directed backwards to the curve of the abdomen.

Hab. Aru.

8. *POLYRHACHIS MUCRONATUS*. *P. lævis*, nitidus, niger; thorace spinis duabus crassis compressis acutis posticè armato.

Worker. Length $2\frac{1}{2}$ lines. Black, smooth, and shining, very delicately and indistinctly aciculate; the antennæ beneath and the tibiæ and femora obscurely ferruginous, the anterior and intermediate tibiæ brightest; the apex of the mandibles ferruginous. Thorax transverse

in front, or very slightly curved, with the lateral angles acute; the thorax is rounded above, and not margined at the sides; the metathorax armed with two long, stout, acute compressed spines; the spines divergent, as well as two on the scale of the petiole, which are long and very acute. Abdomen globose.

Hab. Aru.

9. *POLYRHACHIS GEOMETRICUS*. *P. niger*; antennarum apice, tibiis tarsorumque apice ferrugineis, thorace circulariter striato.

Worker. Length 2 lines. Black; the apical joints of the flagellum, the anterior legs, the anterior and intermediate tibiæ, and the apical joints of the tarsi pale ferruginous; the extreme base of the anterior tarsi black. Thorax rounded above, not margined, gradually narrowed posteriorly; the prothorax of the same width as the head, its lateral angles toothed; the disk with a circular striation. Abdomen globose and pubescent; the scale of the petiole compressed, its superior margin rounded, and with four minute teeth.

Hab. Aru.

10. *POLYRHACHIS IRRITABILIS*. *P. niger*, pube pallidè aureâ vestitus; thorace quadridentato, petioli squamulâ bidentatâ.

Female. Length $6\frac{1}{2}$ lines. Black, and densely clothed with short pale golden pubescence; all parts of the insect sprinkled with erect cinereous hairs; the mandibles shining black, the palpi pale testaceous; the head elongate, the eyes placed high on the sides of the head, ferruginous and very prominent. Thorax elongate-ovate; the prothorax with a short, stout, acute tooth on each side, slightly curved and directed forwards; the metathorax with a similar tooth on each side directed backwards; the wings subhyaline, the nervures fuscous; the legs fusco-ferruginous, the femora and coxæ brightest. Abdomen ovate; the scale incrassate, armed above with two stout acute teeth.

Hab. Aru.

This is probably the female of *P. sexspinosus*.

11. *POLYRHACHIS LÆVISSIMUS*. *P. niger*, lævis nitidusque; metathorace bispinoso, petioli squamulâ quadrispinosâ, pedibus ferrugineis.

Worker. Length $2\frac{3}{4}$ lines. Black, very smooth and shining; the legs ferruginous, with the coxæ, articulations, and the tarsi black. The thorax not flattened above, or margined at the sides; the division between the pro- and mesothorax distinct, that between the meso- and metathorax not discernible, the latter with two erect acute spines; the scale of the petiole with four short acute spines. Abdomen globose.

Hab. Aru.

This species is very like *P. mucronatus*; on close examination, however, it is seen to be very distinct: it may be at once distinguished by its larger head, which is wider than the thorax, rounded behind the eyes, and widely emarginate behind.

12. *POLYRHACHIS BELLICOSUS*. *P. capite abdomineque nigris, thorace femoribusque rufis, thorace quadrispinoso, petioli squamulâ bihamatâ.*

Worker. Length $3\frac{1}{2}$ lines. Black, with the scale of the petiole, thorax, coxæ, and femora blood-red. Thorax: the lateral margins raised above, with two slightly curved divergent spines in front, and two stout, acute, long curved spines in the middle, directed backwards; the scale of the petiole forming a long erect pedestal, which terminates above in two much bent acute hooks, directed backwards, and being as high as the basal segment of the abdomen; the spines and hooks black at the apex. Abdomen ovate.

Hab. Aru.

13. *POLYRHACHIS HECTOR*. *P. niger et vestitus pube pallidè aureâ; prothorace petiolique squamulâ bispinosis, pedibus ferrugineis.*

Worker. Length 3 lines. Black; the apex of the scape and the legs ferruginous; the extreme base of the tibiæ and the tarsi black; a stout acute spine on each side of the prothorax, directed forwards; the thorax flattened above, its lateral margins raised; the divisions of the segments very distinctly impressed; the pale golden pubescence on the abdomen thinner than on the head and thorax. The scale of the petiole angled at the sides towards its summit, the angles dentate, the upper margin straight, and at each lateral angle an acute spine, directed backwards, and curved to the shape of the abdomen; the spines parallel.

Hab. Aru.

14. *POLYRHACHIS RUFOFEMORATUS*. *P. niger, lævis, nitidus; femoribus abdominisque squamulâ ferrugineis.*

Worker. Length $3\frac{1}{2}$ lines. Black; head oblong; the eyes placed high at the sides near the vertex, the front very prominent, with two elevated carinæ in the middle, at the outside of which the antennæ are inserted. Thorax: the divisions strongly marked, flattened above with the sides elevated; the prothorax with an acute spine on each side anteriorly; the coxæ and femora ferruginous, with the apex of the latter more or less fuscous. Abdomen: the base and the scale ferruginous, the latter angled at the sides and emarginate above.

Hab. Aru.

Gen. *PONERA*, Latr.

1. *Ponera rugosa*, Smith, *Cat. Hym. Ins. Proc. Linn. Soc.* ii. 66. 5.

Hab. Aru. Borneo.

2. *PONERA SCULPTURATA*. *P. nitida nigra; capite, thorace abdominisque segmentis primo et secundo profundè striatis, nodo spinis duabus acutis armato; pedibus abdomineque apice ferrugineis.*

Worker. Length 5 lines. Black and shiny, the legs obscurely ferru-

ginous as well as the mandibles; the head strongly and evenly striated longitudinally. The prothorax with a circular striation above; behind, the thorax is compressed, the sides being obliquely striated, the striæ uniting and crossing the central ridge of the thorax. The node of the petiole and basal segment of the abdomen with a curved striation, the second segment longitudinally striated and depressed at its base, which is smooth and shining; the basal half of the third segment is longitudinally striated.

Hab. Aru.

This species is at first sight very like the *P. geometrica* from Singapore; but the striation of the abdomen alone will serve to distinguish it.

3. *PONERA PARALLELA*. *P. nigra*, opaca; antennis, mandibulis, pedibus abdominisque apice ferrugineis.

Worker. Length $3\frac{1}{4}$ lines. Opaque black; the antennæ thick and scarcely as long as the thorax, their apex and the mandibles bright ferruginous; the legs somewhat obscure ferruginous, with the articulations much brighter; the head a little wider than the thorax and subovate; the thorax, node of the petiole, and the abdomen of nearly equal width, the abdomen being slightly the widest; the node of the petiole nearly quadrate; the apical margin of the first segment and base of the second slightly depressed.

Hab. Aru.

4. *PONERA QUADRIDENTATA*. *P. atro-fusca*; antennis, facie anticè, antennis, mandibulis, tibiis tarsisque ferrugineis; alis subhyalinis.

Female. Length $3\frac{1}{2}$ lines. Nigro-fuscous; the antennæ with a carina between their base, the face anteriorly, the mandibles, the legs, and the abdomen at its apex and beneath, ferruginous; the femora and coxæ above, fuscous; the head subquadrate with the angles rounded; the eyes small and placed forwards on the sides of the head towards the base of the mandibles, the latter with four strong teeth on their inner margin. Thorax oblong-ovate with the metathorax truncate; the wings fusco-hyaline, the stigma large and black. Abdomen: the second segment slightly narrowed at its base, the node of the petiole incrassate and compressed, its upper margin rounded. The insect entirely covered with a short downy cinereous pile, the abdomen having also a number of scattered erect glittering hairs.

Hab. Aru.

Gen. *ECTATOMMA*, *Smith*.

1. *ECTATOMMA RUGOSA*. *E. fusco-brunnea*; capite, thorace, nodoque rugosis; abdomine delicatulè aciculato.

Worker. Length 4 lines. Obscure fusco-ferruginous, the antennæ and legs bright ferruginous; the head, thorax, and node of the petiole coarsely rugose; the eyes very prominent and glassy; the mandibles

longitudinally but very delicately striated, their inner margin edentate; the thorax slightly narrowed behind. Abdomen very delicately aciculate.

Male. Length $3\frac{1}{2}$ lines. Of the same colour, and sculptured like the worker; the head rounded behind the eyes and narrowed before them; the eyes very large, prominent and ovate; the ocelli very bright and prominent; antennæ elongate and slender, the scape short, not longer than the second joint of the flagellum. Thorax: the scutellum prominent, forming a rounded tubercle, the metathorax elongate and oblique. Abdomen aciculate as in the worker, but much more deeply strangled between the first and second segments; the petiole rugose and clavate.

Hab. Aru.

Gen. ODONTOMACHUS, *Latr.*

1. *Odontomachus simillimus*, *Smith, Cat. Form.* p. 80. 11 ♀.

Hab. Aru. Ceylon.

2. ODONTOMACHUS TYRANNICUS. *O.* capite thoraceque nigris, antennis abdomineque ferrugineis, margine interno mandibulorum serratulo.

Worker. Length 7 lines. Head oblong, narrowed behind, posteriorly deeply emarginate; the mandibles rufo-piceous, brightest at their apex, which is armed with two long teeth which are bent abruptly inwards, their tips black; the anterior portion of the head striated obliquely from the centre; the head, behind the anterior sulcation, very smooth and shining and having a deep longitudinal central depression. Thorax transversely striated, the articulations of the legs and the tarsi ferruginous. Abdomen smooth, shining, and ferruginous; the node of the petiole incrassate, cylindric, and tapering upwards into a very acute spine.

Hab. Aru.

3. ODONTOMACHUS MALIGNUS. *O.* ferrugineus; capite suprâ obliquè striato; margine interno mandibulorum confertim serrato; metathorace transversim striato; squamâ unispinosâ; abdomine lævissimo.

Worker. Length 7 lines. Ferruginous; the flagellum and legs palest; head much narrowed behind, the posterior margin deeply emarginate; mandibles smooth and shining, their inner margin strongly serrated, their apex abruptly bent or elbowed, and armed with two stout teeth; the face anteriorly evenly striated obliquely; the head behind the anterior sulcation very delicately striated obliquely. The prothorax smooth and shining, the meso- and metathorax transversely striated. Abdomen very smooth and shining; the node of the petiole incrassate and tapering upwards into an acute spine.

Hab. Aru.

This species most closely resembles *O. maxillaris* from Brazil; but its

smooth polished prothorax alone would distinguish it; its head is much broader anteriorly, and less elongate.

Gen. PSEUDOMYRMA, *Guér.*

1. PSEUDOMYRMA LÆVICEPS. *P. nigra*, lævis et nitida; antennis, mandibulis, tibiis anterioribus, tarsisque rufo-fulvis.

Worker. Length $2\frac{1}{4}$ lines. Black and shining; head very smooth and slightly emarginate behind, the eyes large and ovate; the mandibles and antennæ rufo-fulvous. Thorax with the sides flattened, the disk slightly convex; a deep strangulation between the meso- and metathorax, the latter rounded above and oblique behind; the trochanters, articulations of the legs, and the tarsi rufo-fulvous. Abdomen thinly covered with a fine cinereous pile; the first node of the petiole somewhat oblong-ovate, the second subglobose, the petiole of the first node short.

Hab. Aru.

Gen. PODOMYRMA, *Smith.*

Head oblong in the *female*, rather wider than the thorax; in the *worker* subovate and much wider; *eyes* small, ovate and placed about the middle at the sides of the head; *antennæ* geniculated, the scape about two thirds of the length of the flagellum which is clavate, the club three-jointed; the *mandibles* stout and dentate; the *labial palpi* 3-jointed; the *maxillary palpi* 4-jointed. *Thorax*, oblong-ovate in the *female*, in the *worker* transverse in front and narrowed behind with the metathorax bidentate; the anterior wings with one elongate marginal cell and two submarginal cells, the second extending to the apex of the wing; the legs stout, the femora incrassate; abdomen ovate, the peduncle with two nodes.

The insects included in this genus are undoubtedly most nearly allied to those belonging to the genus *Myrmecina*; but, excepting that they agree in having the same number of joints in the palpi, they have little resemblance to each other. With the exception of the genus *Myrmecia*, these are the largest insects in the subfamily Myrmicidæ; and all the species are distinguished by their remarkably thickened femora and margined thorax: we are unacquainted with the males.

1. PODOMYRMA FEMORATA. *P. ferruginea*; capite oblongo, obliquè striato, thorace abdomineque lævibus nitidis; alis subhyalinis fusconebulosis; femoribus valdè incrassatis, basi tenuissimis, femoribus posticis infra compressis.

Female. Length 8 lines. Rufo-testaceous; the mandibles and anterior margin of the face black, the inner margin of the mandibles rufo-piceous and armed with six short stout teeth, the apical tooth largest. The head oblong, slightly narrowed posteriorly and emarginate be-

hind, longitudinally striated, the striæ diverging from the centre at the anterior ocellus; at half the distance between the posterior ocelli and the margin of the vertex the striæ are transverse. Thorax smooth and shining, with scattered fulvous hairs; the wings fusco-hyaline, with a dark fuscous stain occupying the marginal cell and traversing the course of all the nervures; the legs with the femora much incrassated, the posterior pair compressed beneath into a flattened process or keel. Abdomen ovate, smooth, shining, and with a scattered fulvous pubescence; the first node of the petiole rounded in front, narrowed and truncate behind, with a large compressed tooth beneath; the second node subglobose.

Worker major. Length 4 lines. Ferruginous, entirely smooth and shining; the thorax, legs, and abdomen more or less obscure, the femora being usually rufo-piceous; the mandibles striated with their margins black. Thorax nearly flat above, very slightly convex with the sides margined, the anterior margin slightly rounded, the lateral angles produced into small acute spines; a deep strangulation at the base of the metathorax, a little before which the lateral margins are produced into an angular tooth, the metathorax with two short acute spines; the femora thickly incrassate. Abdomen ovate.

Hab. Aru.

2. *PODOMYRMA STRIATA.* *P. ferruginea*; capite thoraceque longitudinaliter striatis, femoribus valdè incrassatis, basi tenuissimis.

Worker. Length 3 lines. Rufo-ferruginous with the abdomen obscure, becoming blackish at the apex, the head coarsely striated, with a central portion from the insertion of the antennæ to the hinder margin of the vertex delicately so; the mandibles striated, with the teeth on their inner margin black. Thorax rugose-striate, the anterior lateral angles dentate, the metathorax without spines; the femora thickly incrassate and greatly attenuated at their base. Abdomen ovate, smooth and shining; the nodes of the petiole rugose.

Hab. Aru.

This species resembles *P. femorata*, but is easily distinguished by its striated head and thorax; the latter is similarly flattened above and margined at the sides; the femora are also thickened precisely as in that species.

3. *PODOMYRMA LÆVIFRONS.* *P. obscurè ferruginea*; capite abdomineque lævissimis lucidisque; thorace longitudinaliter striato; femoribus medio valdè incrassatis, basi tenuissimis.

Worker. Length $2\frac{1}{2}$ lines. Head and abdomen smooth, shining black, in some examples fusco-ferruginous; the antennæ, legs, and thorax ferruginous, the latter longitudinally striated; the thorax margined at the sides, the disk slightly convex, the anterior margin slightly rounded, with the lateral angles armed with short acute spines, the

thorax deeply strangulated posteriorly, the metathorax not spined; the femora thickly swollen in the middle and very slender at their base and apex. Abdomen ovate, the first node of the petiole oblong, the second globose.

Hab. Aru.

There is considerable variation in intensity of colouring in examples of this species, the thorax and legs being sometimes pale ferruginous; in the specimen described they are dark; every shade of gradation occurs in different individuals.

4. *PODOMYRMA BASALIS*. *P. fusco-ferruginea*; abdominis basi pallidè testacea; femoribus medio incrassatis, basi tenuibus.

Worker. Length 3 lines. Obscurely ferruginous, the scape of the antennæ, the base of the femora and the tibiæ pale ferruginous; the base of the abdomen pale testaceous; the head and thorax with deep coarse longitudinal furrows; the flagellum blackish-brown towards its apex, with the extreme tip pale. Thorax: the anterior margin slightly rounded with the lateral angles very acute; the femora very thickly incrassate in the middle; the apex of the tibiæ ferruginous. Abdomen smooth and shining; the basal half pale testaceous, the apical half and the following segments black; the nodes of the petiole rugose; the first node elongate, with a short acute tooth at the base above, and a blunt one beneath.

Hab. Aru.

Gen. MYRMICA, Latr.

1. *MYRMICA PARALLELA*. *M. rufo-fulva*; antennis pedibusque pallidè testaceis; abdomine fusco-ferrugineo; capite thoraceque longitudinaliter striatis.

Worker. Length 1 line. Head and thorax ferruginous and longitudinally and evenly striated; antennæ and legs pale rufo-testaceous. Thorax margined at the sides, the disk slightly convex, the anterior margin transverse, the lateral angles acute; the metathorax with two short spines; abdomen dark fusco-ferruginous, the nodes of the petiole subrugose; club of the antennæ 3-jointed.

Hab. Aru.

2. *MYRMICA SCABROSA*. *M. nigra*; capite thoraceque scabrosis, metathorace bispinoso, abdomine ovato lævi.

Worker. Length 1 line. Black; the head, thorax, and nodes of the petiole roughened; the mandibles, flagellum and tarsi rufo-testaceous; the lateral angles of the prothorax acute, the sides narrowed slightly to the base of the metathorax, the spines on the latter acute; nodes of the petiole globose. Abdomen ovate, smooth and shining; club of the antennæ 3-jointed.

Hab. Aru.

3. *MYRMICA THORACICA*. *M.* capite abdomineque nigris; antennis, mandibulis thorace pedibusque flavis.

Worker. Length $\frac{3}{4}$ line. Head and abdomen jet-black; the antennæ, thorax, and legs of a clear honey-yellow; the mandibles of a more obscure yellow; the anterior margin of the thorax transverse, the lateral angles acute, narrowed from thence to the base of the mesothorax, the disk anteriorly slightly convex; the metathorax armed with two acute spines. Abdomen nearly round, and very smooth and shining; the first node of the petiole vertical anteriorly, and gradually rounded behind, the second node transverse, its anterior margin straight, the angles rounded, the sides narrowed towards the abdomen; the club of the antennæ 3-jointed.

Hab. Aru.

The singular form of the thorax of this species, as well as the construction of the nodes of the petiole, appear to indicate an uncharacterized division of the genus *Myrmica*.

4. *MYRMICA SUSPICIOSA*. *M.* rufo-testacea, lævis, tota nitidissima nuda; mandibulis, antennis, pedum articulationibus tarsisque pallescentibus; metathoracis spinis minutissimis.

Worker. Length 1 line. Rufo-testaceous and very smooth and shining; the antennæ as long as the insect; the flagellum, mandibles, tarsi, and articulations of the legs pale testaceous. The thorax narrowed anteriorly into a short neck, behind which it is dilated, the sides being rounded, the meso- and metathorax narrower and of nearly equal width, the spines of the metathorax minute and slender. The first node of the petiole somewhat wedge-shaped, the second globose, the abdomen very smooth and shining; club of the antennæ 3-jointed.

Hab. Aru.

I can detect no specific difference between this and *Myrmica lævigata*, taken by myself in the neighbourhood of London; but it is not uncommonly met with in hothouses, near to which I captured my specimen. I believe *M. lævigata* is identical with *Æcophthora pusilla*, the House-Ant of Madeira.

5. *MYRMICA MELLEA*. *M.* capite thoraceque flavis; abdomine pallidè fusco.

Worker. Length $1\frac{3}{4}$ line. Head, antennæ, thorax, and legs honey-yellow and very smooth and shining; thorax strangulated at the base of the metathorax, which is not spined; the first node of the abdomen is oblique anteriorly, and vertical behind, the second node subglobose. Abdomen: the base honey-yellow, the apical margin of the first segment, and the following segments entirely, pale fuscous; the club of the antennæ 2-jointed.

Hab. Aru.

6. *MYRMICA CARINATA*. *M.* obscurè fusco-ferruginea; thorace rufo-

fulvo; capite thoraceque carinis irregularibus; metathorace spinis duabus longis armato.

Worker. Length $1\frac{1}{4}$ lines. Head and abdomen black, with more or less of an obscure ferruginous tinge, particularly at the vertex and base of the abdomen; the thorax and nodes of the petiole ferruginous; the legs rufo-piceous, with the tarsi and articulations ferruginous, the antennæ and mandibles ferruginous; the head and thorax with irregular distant longitudinal carinæ; the sides of the thorax rugose; the spines on the metathorax long and acute; the abdomen very smooth and shining; the club of the antennæ 3-jointed.

Hab. Aru.

Gen. CREMATOGASTER, *Lund.*

1. *Crematogaster obscura*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc.* ii. 76. 4 ♀.

Hab. Aru; Borneo.

2. CREMATOGASTER ELEGANS. *C. pallidè rufo-testaceus*; abdomine nigerrimo nitido; thorace bispinoso.

Worker. Length $\frac{3}{4}$ line. Entirely pale rufo-testaceous, excepting the eyes and abdomen which are jet black; the nodes of the petiole pale, smooth, and shining. Head about the same width as the abdomen. The lateral angles of the anterior margin of the prothorax acute, the metathorax armed with two long acute spines. Abdomen heart-shaped, its apex acute.

Hab. Aru.

3. CREMATOGASTER INSULARIS. *C. niger, lævis et nitidus*; antennis tarsisque pallidè testaceis; thorace spinis duabus acutis armato.

Worker. Length $1\frac{1}{4}$ line. Black, smooth and shining; the vertex, thorax and nodes of the peduncle with an obscure ferruginous tinge; the antennæ, tarsi, and articulations of the legs pale rufo-testaceous; the spines which arm the metathorax stout, elongate, and acute, with their apex pale testaceous. Abdomen heart-shaped and very acute at the apex.

Hab. Aru.

Gen. SOLENOPSIS, *Westw.*

1. SOLENOPSIS CEPHALOTES. *S. pallidè ferruginea*; capite maximè in medio sulcato, abdomine apice fusco.

Worker major. Length $2\frac{1}{2}$ lines. Pale ferruginous, with the anterior part of the face darker, the mandibles incrassate and very dark fusco-ferruginous; head very large and divided by a deep longitudinal channel, emarginate behind, nearly quadrate; the eyes small and placed forwards on the sides of the head. The metathorax truncate, not spined. Abdomen ovate, truncate at the base, its apex fuscous; the first node of the petiole compressed, its margin rounded above,

the second node incrassate and subglobose; club of the antennæ 2-jointed.

Worker minor. Length $1\frac{1}{2}$ line. Of the same colour as the *worker major*, but with the head of the ordinary size and slightly narrowed behind, the mandibles of the same colour as the head; the legs and antennæ longer, as well as the petiole of the abdomen; the body is very smooth and shining, the club of the antennæ 2-jointed.

Hab. Aru.

Subfam. CRYPTOCERIDÆ, *Smith.*

Gen. MERANOPLUS, *Smith.*

1. MERANOPLUS SPINOSUS. *M. castaneo-rufus*; abdomine nigro, thorace sexspinoso; abdomine ovato.

Worker. Length $1\frac{1}{2}$ line. Head and thorax rugose; the antennæ and tarsi rufo-testaceous; the eyes rather prominent, the groove above them at the sides of the head extending backwards to the vertex. Thorax: the anterior margin curved forwards, the lateral angles produced into a bifurcate process on each side, behind the processes, slightly narrowed to the base of a long curved tooth; the posterior margin emarginate with a long sharp spine at each angle of the emargination; the node of the petiole globose. Abdomen black, smooth and shining.

Hab. Aru.

Fam. MUTILLIDÆ, *Leach.*

Gen. MUTILLA, *Linn.*

1. *Mutilla Sibylla*, *Smith, Proc. Linn. Soc. ii. 86. 11 ♀.*

Hab. Aru; Borneo; Celebes.

2. MUTILLA MANIFESTA. *M. capite abdomineque nigris, thorace sanguineo-rubro, maris alis nigro-fuscis.*

Female. Length $4\frac{3}{4}$ lines. Head black and rugose. The thorax blood-red and coarsely rugose, its anterior margin widest and straight, the sides gradually narrowed to the apex in a slight curve; the lateral margins have two teeth not wide apart. Abdomen black, rugose, and slightly shining, with black pubescence above; on the under surface it is glittering silvery-white; the legs and sides of the thorax have a similar pubescence.

Male. The same size as the female, and the same colour; the eyes notched. The thorax oblong-quadrate, the posterior lateral angles acute; the tegulæ large and red; the wings dark brown, with their extreme base hyaline. Abdomen shining black, the first and second segments strongly punctured, the rest much more finely and not very closely so.

Hab. Aru.

3. MUTILLA CARINATA. *M. capite thoraceque metallico-purpureis*

viridi tinctis, pedibus ferrugineis, abdomine nigro, basi pallido fasciatâ, segmento secundo ad apicem fasciâ bilobatâ ornato.

Female. Length $4\frac{1}{2}$ lines. The head and thorax of a metallic purple tint with shades of green and copper; the scape of the antennæ, the mandibles, palpi, and legs ferruginous; the head and thorax closely and strongly punctured. The abdomen velvety black; the base truncate, the truncation smooth and shining; its margin carinate; the upper surface of the basal segment yellowish-white, a broad bilobed fascia of the same colour at the apical margin of the second segment; the apex ferruginous. *Male.* The head and thorax metallic green, strongly and closely punctured; abdomen black and shining, much more finely punctured than the thorax; wings light brown, with their base and extreme apex hyaline; the legs ferruginous.

Hab. Aru.

4. *MUTILLA NIGRA.* *M. nigra et punctata*, abdomine lævi et nitido, delicatulè punctato, alis fuscis, basi hyalinis.

Male. Length $6\frac{1}{2}$ lines. Black; head and thorax closely and strongly punctured; the eyes slightly notched; the face with silvery-white pubescence, the mandibles shining, the palpi black. Thorax: the metathorax densely clothed with yellowish-white pubescence; the legs with glittering white hairs, the calcaria white; wings brown with their base hyaline. Abdomen smooth and shining, delicately and sparingly punctured, with a few silvery hairs at the sides.

Hab. Aru.

5. *MUTILLA EXILIS.* *M. nigra et punctata*; abdomine lævigato, nitido; alis subhyalinis; facie et metathorace pube argentatâ vestitis.

Male. Length $6\frac{1}{2}$ lines. Black; head and thorax strongly punctured; the eyes emarginate, the face with glittering silvery-white pubescence, the cheek thinly sprinkled with silvery hairs; the palpi testaceous. Thorax: the metathorax densely clothed with silvery pubescence, beneath, at the sides, and also the legs with scattered silvery hairs, the calcaria white; the tegulæ shining; the wings subhyaline with the nervures dark fuscous. Abdomen shining black, smooth, and very delicately and sparingly punctured, the apical margins of the segments very thinly fringed with glittering silvery hairs.

Hab. Aru.

Tribe FOSSORES, *Latr.*

Fam. SCOLIADÆ, *Leach.*

Gen. MYZINE.

1. *MYZINE TENUICORNIS.* *M. nigra*, alis hyalinis, abdomine nitido flavoque variegato.

Male. Length 7 lines. Black; the head and thorax very closely punctured, thinly clothed with griseous pubescence, that on the face, thorax

beneath, and on the coxæ most dense and glittering; antennæ more slender than is usual in this genus, and tapering to their apex, the joints slightly subarcuate; the mandibles bidentate at their apex and with a yellow spot at their base. Thorax: the posterior margin of the prothorax, a spot beneath the wings, the tegulæ, and the post-scutellum yellow; the anterior and intermediate tibiæ ferruginous and more or less dusky above, the posterior pair ferruginous beneath. Abdomen shining, the margins of the segments deeply depressed; a small ovate spot on each side of the first segment, the second and three following segments with a narrow stripe on each side in the middle, yellow; the yellow markings obscure; the apical segment coarsely rugose; beneath, the segments are closely and strongly punctured.

Hab. Aru.

Gen. *SCOLIA*, *Fabr.*

Division I. The anterior wings with two submarginal cells and two recurrent nervures.

1. *Scolia grossa*, *Burm. Abh. Nat. Ges. Halle*, i. p. 23. (*Tiphia grossa*, *Fabr. Syst. Piez.* p. 232. 4.)

Hab. Aru; Java.

The specimens of this species received from Aru are only 9 lines in length; I have examined others from Celebes, Borneo, India, and Java, showing every difference between 9 lines and 18 lines.

Division II. Anterior wings with two submarginal cells and one recurrent nervure.

2. *SCOLIA NITIDA*. *S. nitida*, *aterrima*; *alis æneo et violaceo splendide micantibus*.

Female. Length 11 lines. Shining jet-black, the abdomen with prismatic tints. The flagellum fusco-ferruginous beneath, the mandibles ferruginous at their apex; the wings dark brown with a splendid lustre of coppery and golden tints mixed with shades of violet. The head with a few punctures behind the ocelli; the thorax with scattered punctures; the metathorax finely but not closely punctured; the disk of the mesothorax impunctate; the abdomen with fine scattered punctures; the apical segment opaque, rugose, and with its apical margin pale testaceous; the abdomen beneath with strong distant punctures.

Hab. Aru.

3. *SCOLIA FULGIDIPENNIS*. *S. nitida*, *nigra*; *abdomine prismatico, alis fuscis viride et violaceo micantibus*.

Female. Length 12-13 lines. Jet-black, shining; head very smooth, the hinder margin of the vertex finely punctured, the face with a few fine scattered punctures; the flagellum obscurely rufo-fuscous. Thorax finely punctured, the disk of the mesothorax impunctate; wings dark brown with a splendid green iridescence, with violet tints to-

wards their base; the legs thickly spinose and pubescent; the calcaria simple. Abdomen with scattered fine punctures; the apical segment densely clothed with black pubescence; beneath, with strong scattered punctures.

Male. Rather smaller than the female, much more closely punctured, and not so shining and smooth; the face with a transverse arched carina above the insertion of the antennæ, which enters the emargination of the eyes; the clypeus strongly punctured; in other respects resembling the female.

Hab. Aru.

This species belongs to Guérin's division Liacos, of which *S. dimidiata* is the type; the third discoidal cell is petiolated, the petiole entering the second submarginal about the middle.

4. *SCOLIA INSULARIS*. *S. nitida nigra*; abdomine prismatico, alis obscurè fuscis cupreo submicantibus.

Male. Length 7-9 lines. Shining black; head punctured, the vertex most finely and distinctly so. Thorax punctured, the disk of the mesothorax impunctate, the punctures wide apart on the scutellum and metathorax; the wings dark brown with a coppery iridescence, which has a remarkable dimness as if breathed upon. The basal segment of the abdomen strongly and closely punctured; the following segments more finely and distantly punctured, particularly the second and third segments.

Hab. Key Island.

5. *SCOLIA QUADRICEPS*. *S. nitida nigra*; fœminæ capite magno subquadrato, alis fuscis cupreo iridescentibus.

Female. Length 6-8 lines. Black and shining; head subquadrate, smooth and shining, as wide as the thorax, with a few punctures at the sides of the face and between the antennæ. Thorax finely punctured, with the disk of the mesothorax impunctate; wings dark brown with a rich coppery iridescence. Abdomen with a fine prismatic lustre, closely and strongly punctured towards the apex and at the extreme base, the second segment and the middle of the third with only a few very fine scattered punctures.

Hab. Aru.

This species also belongs to the division Liacos; the petiolated cell is small and oblong-quadrate; the male exactly resembles the female, except that its head is smaller and narrower than the thorax; the abdomen is rather more strongly punctured.

Gen. POMPILUS, *Fabr.*

1. *POMPILUS DUBIUS*. *P. niger*, pilis mutabili-sericeis tectus; alis subhyalinis, apice nebuloso.

Female. Length $4\frac{1}{4}$ lines. Black and covered with a thin changeable silvery pile, which is most dense on the sides of the metathorax and base of the segments of the abdomen. The vertex emarginate behind, the eyes very large, their inner orbits emarginate, reaching high on

the sides of the head nearly to the margin of the vertex; the clypeus emarginate in front, the labrum produced. Thorax: the prothorax subelongate, narrowed anteriorly; the wings subhyaline, their apex clouded; the intermediate and posterior tibiæ with a double row of spines; all the tarsi simple; the calcaria stout and elongate. Abdomen shining, with the margins of the segments slightly depressed.

Hab. Aru.

Subgen. *AGENIA*, *Schiödtte*.

1. *Agenia blanda*, *Guér. Voy. Coq. Zool.* pt. 2. ii. p. 260.

Hab. Celebes; India; Singapore; Malacca; Borneo; Key Island.

2. *AGENIA CALLISTO*. *A. nigra*, pilis sericeis vestita; facie thoraceque subtus pube argentato-albâ densè vestitis; alis fasciis duabus angustis.

Female. Length 8 lines. Black; the face, clypeus, and cheeks with a dense silvery-white pile; the tips of the mandibles obscurely ferruginous, the palpi black. Thorax with a brilliant silvery-white pile on the sides, beneath, and on the coxæ; the metathorax transversely rugose; the wings hyaline; the anterior pair with a narrow fuscous fascia at the apex of the externo-medial cell, and a second rather broader at the base of the marginal cell, which does not quite cross the wing; the apex of the wing fuscous. Abdomen petiolated, smooth and shining, with a beautiful glossy pile, which is most dense at the sides; the apical segment longitudinally subcarinated in the middle above.

Hab. Aru.

3. *AGENIA JUCUNDA*. *A. nitida nigra*; facie metathorace abdomineque pube sericeâ vestitis; antennis, pedibus, abdominisque marginibus apicalibus ferrugineis; alis hyalinis.

Female. Length $5\frac{1}{2}$ lines. Black; head, pro- and mesothorax, as well as the scutellum, glassy-smooth and shining; the face covered with silvery-white pile; the antennæ, tips of the mandibles, and the legs ferruginous; the palpi elongate and pale rufo-testaceous. Thorax: the wings hyaline and iridescent, the nervures very slender and pale rufo-testaceous, the stigma fuscous; the metathorax rounded behind, transversely rugose, and covered with silvery-white pile. Abdomen petiolated; the apical margins of the second and following segments ferruginous, the apical segment entirely so; the ferruginous band on each segment produced in the middle into an angular shape; on the abdomen beneath they are similarly produced; the basal segment entirely ferruginous, with a black spot on each side.

Hab. Aru.

4. *AGENIA ALTHEA*. *A. nigra*; facie pube argentato-albâ vestitâ, thorace abdomineque sericeo pubescentibus; alis hyalinis, venis nigris.

Female. Length 5 lines. Black; the face silvery; the anterior margin of the clypeus rounded and narrowly smooth and shining; tips of the mandibles ferruginous; the mandibles elongate and pale rufo-testaceous. Thorax: the metathorax finely transversely rugose, the sides with bright silvery-white pubescence; the coxæ, the thorax beneath and on the sides, with fine silky sericeous pile; the anterior tibiæ and tarsi, and all the femora at their apex beneath, ferruginous; wings hyaline and iridescent, nervures black; the outer margin of the tegulæ testaceous. Abdomen shining, and with a fine silvery sericeous pile; the apical margins of the segments narrowly rufo-piceous; the terminal segment with an elongate, smooth, shining space, which extends to the apex, which is testaceous.

Hab. Aru.

5. *AGENIA ALCYONE.* *A. nigra*, pilis sericeis cinereis vestita; antennis pedibusque ferrugineis, alis hyalinis; abdomine petiolato; marginibus apicalibus segmentorum flavis.

Male. Length 7 lines. Black; the antennæ, tips of the mandibles, and the legs ferruginous; the scape in front, a narrow line on the inner orbit of the eyes, and the anterior portion of the clypeus yellow; the antennæ fuscous above towards their base. Thorax: the femora beneath towards their base, the trochanters and coxæ, except their apex, black; the apical joints of the intermediate and posterior tarsi fuscous; wings hyaline, the nervures fusco-ferruginous, the tegulæ reddish-yellow. Abdomen petiolated; the apical margins of the segments with reddish-yellow fasciæ; beneath, the margins of the segments are rufo-piceous, not fasciated.

Hab. Aru.

6. *AGENIA AMALTHEA.* *A. nigra*, pilis tenuibus cinereis sericeis vestita; antennis anticè pedibusque anticis et intermediis anticè ferrugineis; abdomine petiolato; alis hyalinis bifasciatis.

Female. Length 6 lines. Black; the face densely covered with silvery pile; the antennæ in front, the anterior margin of the clypeus and the tips of the mandibles ferruginous; palpi elongate and pale rufo-testaceous. Thorax: the posterior margin of the prothorax narrowly, the tegulæ, the anterior and intermediate femora in front, the posterior pair towards their apex beneath, the anterior tibiæ and tarsi, the intermediate and posterior tibiæ more or less beneath, and their tarsi, ferruginous; the tarsi sometimes dusky above; the wings hyaline, a narrow fuscous fascia at the apex of the externo-medial cell, and a broad one crossing at, and being the width of, the second and third submarginal cells; tips of the wings milky-white; the metathorax rounded posteriorly, transversely finely rugose and densely covered with short silvery-white pubescence at the sides and apex. Abdomen petiolated, smooth and shining, with the apex and the margins of the segments narrowly rufo-piceous.

Hab. Aru.

Gen. PRIOCNEMIS, *Schiödte*.

1. PRIOCNEMIS PULCHERRIMUS. *P. lætè ruber*; alis flavo-hyalinis, apice latè fusco, abdominis lateribus nigris.

Female. Length $7\frac{1}{2}$ lines. Bright red; the anterior margin of the clypeus with a minute tooth in the centre; the tips of the mandibles fuscous. The metathorax slightly striated transversely, and with a central as well as a lateral longitudinal groove; the wings flavo-hyaline, their apex with a fuscous cloud, which commences at the base of the first discoidal cell, the extreme tips pale; the tibiæ and tarsi with short slender spines; the extreme apex of the joints of the posterior tarsi black. Abdomen: the short petiole of the basal segment, and the sides of the second, third, and fourth segments black, leaving a red line down the middle of each; beneath, the second, third, and base of the fourth segments black.

Hab. Aru.

2. PRIOCNEMIS FERVIDUS. *P. capite, antennis, thorace pedibusque ferrugineis*; abdomine nigro; alis fuscis basi subhyalinis.

Female. Length 9 lines. Ferruginous, with the abdomen black; the anterior margin of the clypeus rounded. The metathorax transversely rugose; the pectus, and coxæ at their base within, black; wings brown, with a violet iridescence, their base rufo-hyaline; the intermediate and posterior tibiæ with a double row of spines, all the tarsi spinose. Abdomen shining black, with the extreme apex slightly ferruginous.

Hab. Aru.

Gen. MACROMERIS, *St.-Farg.*

1. MACROMERIS IRIDIPENNIS. *M. cæruleo-nigra*; abdomine iridescente, alis cæruleo-violaceoque splendide micantibus; pedibus muticis, simplicibus.

Female. Length 12 lines. Blue-black; abdomen with a changeable iridescent pile; head and thorax with a black velvety pubescence; the metathorax very finely rugose and opaque; the legs simple; the posterior tibiæ villose within; the wings very dark brown, with a splendid violet and blue iridescence.

Male. Very closely resembling the female, but rather smaller; the anterior and intermediate femora more incrassate, and all the femora with a simple row of teeth or serrations on their inferior margins.

Hab. Aru.

Although this species of *Macromeris* is very similar in colour to the *M. violacea* of St.-Fargeau, the femora are not so thick as in that species, not in fact much more so than in the female; and the row of teeth beneath is a strong specific character.

Gen. *SALIUS*, *Fabr.*

1. *SALIUS MALIGNUS*. *S. niger*, pube cinereâ sericeâ vestitus; alis fuscis, albo fasciatis.

Female. Length 9 lines. Black, and covered with a fine thin ashy pile; the scape in front, and the anterior margin of the clypeus narrowly, obscure yellow; the mandibles ferruginous at their apex, which has a single notch; the palpi pale rufo-testaceous. Thorax: the prothorax with a slightly interrupted narrow fascia a little before its posterior margin, and the scutellum, yellow; the anterior femora broadly dilated, and, as well as the anterior tibiæ, ferruginous within; the intermediate tibiæ ferruginous at their apex in front, and the posterior pair with a yellowish-white spot at their base outside; the calcaria pale testaceous, the claws ferruginous, the anterior tarsi entirely so, but more or less obscure; the posterior tibiæ slightly spinose; the anterior wings brown, with a white fascia crossing at the first discoidal cell, and a second at the apex of the third submarginal, the extreme base and the anterior margin of the externo-medial cell hyaline. Abdomen: the apical margins of the segments with a little bright silvery pile.

Hab. Aru.

Gen. *MYGNIMIA*, *Smith.*

1. *MYGNIMIA ASPASIA*. *M. cæruleo-nigra*; capite thoraceque pube holosericeâ vestitis; alis fulvo-hyalinis; abdomine pilis iridescentibus vestito.

Female. Length 14 lines. Black, with shades of blue in certain lights; the abdomen with bright tints of blue and violet, caused by fine iridescent changeable pile; the legs have a similar pile, very bright on the femora within; the head and thorax with a short black velvety pubescence; the wings flavo-hyaline; the nervures pale ferruginous; the extreme base of the wings blackish, their apical margins with a narrow fuscous border. The legs spinose; the posterior tibiæ with a double row of strong serrations.

Gen. *SPEX*, *Fabr.*

1. *SPEX ARGENTATA*, *Dahlb. Hym. Eur. i. 25. 1.*

Hab. Aru; Celebes; Sumatra; India; Greece; Africa; East Florida.

2. *SPEX SERICEA*, *Fabr. Syst. Piez. 211. 19.*

Hab. Aru; Malacca; Borneo; Java; Philippine Islands.

3. *SPEX AURIFRONS*. *S. niger*; facie pube aureâ vestitâ, alis flavo-hyalinis apice fuscis, abdomine pilis sericeo-aureis vestito.

Female. Black; the face densely clothed with golden pubescence, the head having a number of scattered long golden-yellow hairs. Thorax

thinly covered with long yellow pubescence, which is most dense at the sides of the metathorax; the tibiæ, tarsi, and posterior femora ferruginous; the claw-joint of the tarsi black; the tibiæ and tarsi with black spines; the wings fulvo-hyaline, their apex with a narrow fuscous border, the nervures ferruginous. Abdomen covered with a fine, thin, golden-reflecting pile; the apical margins of the segments rufo-testaceous, the testaceous margin produced in the middle into a triangular shape, most conspicuously so on the segments beneath.

Hab. Aru.

4. *SPHEX NITIDIVENTRIS*. *S. niger*; abdomine nigro-cæruleo, lævigato, nitido; alis fuscis.

Female. Length 12 lines. Black; the face with silvery pubescence, and thinly covered with long black hairs; the clypeus with a central longitudinal carina at the base, which terminates at the middle, from whence to the anterior margin is a broad, smooth, shining space. Thorax shining and finely punctured; the metathorax opaque and covered with long, loose, black pubescence; the legs shining, the posterior tibiæ with shining grey pile within; wings brown, darkest at their base. Abdomen blue, and very smooth and shining, oblong-ovate; the apical segment vertical.

Hab. Aru.

5. *SPHEX SEPICOLA*. *S. niger*; facie pube aureâ vestitâ; alis subhyalinis apice fuscis; abdomine nitido.

Female. Length 9 lines. Black; the face densely clothed with golden pubescence, the cheeks with iridescent pile, with a long, loose, scattered pale yellow pubescence on the head and thorax; the mandibles smooth, shining black. The disk of the thorax with an obscure chalybeous tint, shining and finely punctured; the metathorax opaque and finely rugose; the wings subhyaline, their apical margins fuscous, the nervures fusco-ferruginous. Abdomen with a slender subelongate petiole, and with a thin, silky, grey pile; the apical margins of the segments narrowly and obscurely rufo-piceous.

Male. Rather smaller than the female, more slender and more pubescent, the pubescence on the face paler.

Hab. Aru.

6. *SPHEX GRATIOSA*. *S. capite thoraceque nigris, abdomine cæruleo, alis fusco-hyalinis*.

Male. Length 10 lines. Head and thorax black; the face densely clothed with pale golden pubescence; the labrum and mandibles highly polished, very smooth and shining; a thin pale pubescence is scattered over the head, pro- and mesothorax, the latter obscurely chalybeous above, shining, and finely and closely punctured, with an abbreviated, deeply impressed line in the middle anteriorly; the posterior margin of the prothorax covered with shining silvery pubescence; the

metathorax opaque, and clothed with black pubescence; wings fusco-hyaline, the anterior pair darkest towards their base, the nervures dark fusco-ferruginous, nearly black. Abdomen smooth, shining dark blue; beneath, the margins of the segments have a bright, glittering, pale-golden pile.

Gen. *PELOPÆUS*, *Latr.*

1. *PELOPÆUS LABORIOSUS*. *P. niger*; scapo anticè, pedibus petioloque rufescenti-flavis, alis hyalinis fulvo tinctis.

Female. Length 12 lines. Black, with black pubescence on the head and thorax; the face with a fine cinereous pile; the scape yellow in front; the mandibles smooth and shining. Thorax: the legs pale ferruginous, the posterior femora darkest; the coxæ, the anterior and intermediate trochanters, and base of the femora black; wings fulvo-hyaline, the nervures ferruginous; the metathorax obliquely striated. Abdomen slightly shining at the base, with the petiole reddish-yellow.

Hab. Aru.

Gen. *LARRADA*, *Smith.*

1. *LARRADA MODESTA*. *L. nigra*; abdomine pilis argentatis fasciato; alis hyalinis.

Female. Length $6\frac{1}{2}$ lines. Black; the face covered with silvery down; the mandibles smooth, shining, black, and fringed beneath with fulvous hairs, the cheeks silvery. Thorax slightly shining, closely and delicately punctured; the metathorax opaque and transversely striated; wings subhyaline, with a fuscous border at their apex, the nervures black. Abdomen slightly shining; the apical margins of the first, second, and third segments with fascia of silvery pile, which is very brilliant in certain lights.

Male closely resembles the female, but has an additional fascia on the abdomen.

Hab. Aru.

Gen. *LARRA*, *Fabr.*

1. *LARRA SIMILLIMA*. *L. nigra*, pulchre prismatica, maculis fascisque variis flavis ornata.

Female. Length $6\frac{1}{2}$ lines. Black; the abdomen with tints of blue violet; the thorax slightly prismatic; the labrum, clypeus, an angular scape above, an abbreviated line on the inner orbits of the eyes, the scape in front, and the antennæ beneath, yellow; the cheeks with a silvery reflexion. The thorax beneath, and the metathorax, with a shining white silvery pile; the anterior and intermediate femora and tibiæ beneath yellow; the tarsi pale ferruginous, and more or less fuscous above; wings subhyaline, the nervures fuscous; a spot on the lateral posterior angles of the metathorax, two ovate spots on the scutellum, and a line on the postscutellum yellow. Abdomen: the basal segment with a broadly interrupted fascia a little before its

apical margin; the second and fourth segments with a narrow yellow fascia at their apical margins, which is widened laterally; beneath, the second and third segments with a yellow spot on each side.

The *Male* differs from the female in having a large quadrate black spot on the clypeus, and a spot at the base of the labrum; there is also a narrow yellow line on the posterior margin of the prothorax; and the third segment of the abdomen has a yellow fascia: it is also rather smaller.

Hab. Aru.

This insect very closely resembles *Larra prismatica*, from Borneo, Malacca, and Celebes, of which it may be a variety.

Gen. BEMBEX, *Fabr.*

1. *Bembex melancholica*, *Smith, Cat. Hym.* pt. iv. p. 328; *Proc. Linn. Soc.* ii. p. 105.

Hab. Aru; Sumatra; Borneo.

Many of the specimens from Aru are less highly coloured than those of Sumatra or Borneo: the yellow markings on the abdomen are frequently much obliterated in the females; others are as highly coloured as any examples I have seen.

Gen. PISON, *Spin.*

1. *PISON NITIDUS*. *P. nitidus*, niger, distinctè punctatus; alis subhyalinis, venis fuscis; segmentis abdominalibus apice depressis.

Female. Length 5 lines. Black and shining; the head and thorax strongly punctured; the face beneath, the antennæ, the clypeus, cheeks, and the sides of the segments of the abdomen covered with a silvery down; the palpi pale testaceous; the mandibles obscurely ferruginous at their apex. The metathorax transversely striated behind, with a central longitudinal impressed line above, which is transversely striated, and terminates in a deep fovea just beyond the verge of the posterior inclined truncation; the wings subhyaline; the nervures dark fuscous; the first recurrent nervure received at the apex of the first submarginal cell, and the second at the base of the third submarginal. Abdomen shining, and more delicately punctured than the thorax; the margins of the segments deeply depressed.

Hab. Aru, Key Island.

Gen. GORYTES, *Latr.*

1. *GORYTES CONSTRICTUS*. *G. niger*; clypei lateribus flavis; collari, tuberculis postscutelloque flavis; segmentorum abdominis marginibus apicalibus flavis constrictis, pedibusque flavo variegatis.

Female. Length 6 lines. Black; the head and thorax very closely punctured and opaque, the head slightly shining on the vertex; the antennæ beneath and the apical half of the mandibles ferruginous, the latter black at their tips; the clypeus yellow at the sides, and coarsely rugose in front. Thorax: the metathorax coarsely longitudinally

rugose, with cinereous pubescence at the sides; the antennæ and intermediate tibiæ, the tarsi, and articulations of the legs reddish-yellow; wings subhyaline, with a fuscous cloud in the marginal cell, which passes beyond to the apex of the wings; the nervures fusco-ferruginous; the tegulæ ferruginous. Abdomen shining, covered with a thin, fine, cinereous pile, and with the margins of the segments constricted; the apical margins of the segments with narrow yellow fasciæ, that on the fourth abbreviated on each side, on the fifth it is obsolete; beneath, the second segment is opaque, finely punctured, and pilose; the following segments smooth, shining, and with five scattered punctures.

The *Male* strongly resembles the female, but is smaller and less variegated with yellow; the face covered with silvery down; the scape and base of the flagellum ferruginous beneath; the clypeus yellow, except its extreme base. The thorax black, with the legs rufo-piceous; the tibiæ and tarsi pale ferruginous, variegated with yellow; the sides of the thorax beneath the wings longitudinally striated in both sexes, most conspicuously so in the male. The abdomen with three narrow interrupted fasciæ.

Hab. Aru.

2. *GORYTES VAGUS*. *G. niger*; clypeo maculis duabus flavis notato; postscutello et segmentis primo et secundo fasciâ apicali flavis, fasciâ in segmento primo subinterrupto.

Female. Length 6 lines. Black; the head finely punctured and shining; the anterior margin of the clypeus emarginate in the middle, and more deeply so on each side; on each side of the clypeus, at its base, is an oblique yellow spot, and anteriorly it is roughly punctured; the mandibles roughened at their base, their apical half smooth, shining, and ferruginous, with their apex black. Thorax subopaque, very closely punctured, and slightly shining; the metathorax coarsely longitudinally rugose-striate; the postscutellum yellow; wings subhyaline and iridescent, the nervures fusco-ferruginous; a dark fuscous cloud occupies the marginal cell. Abdomen smooth and shining, with a slightly interrupted fascia a little before the apical margin of the basal segment; the second segment has a fascia at its apical margin; both are yellowish white; the first is gradually widened towards the sides of the segment, the second abruptly widened, with the angle of the widened portion pointed inwards; beneath the abdomen is glossy, with the basal segment closely punctured and subopaque; the margins of abdominal segments slightly constricted.

Hab. Key Island.

Gen. *TRYPOXYLON*, *Latr.*

1. *TRYPOXYLON EXIMIUM*. *T. nigrum*; clypeo argentato-pubescente; abdominis segmentis secundo tertio quartoque basi rubris; alis hyalinis.

Female. Length $8\frac{1}{2}$ lines. Black, smooth, and shining; the head and thorax very delicately punctured; the face and clypeus below the insertion of the antennæ densely covered with silvery-white pubescence; the anterior margin of the clypeus rounded and much produced, with a slight curving upwards at its margin; the mandibles yellow, with their apex ferruginous; the palpi pale testaceous; the inner orbits of the eyes very deeply notched. Thorax: the metathorax, the sides, and beneath with a thin silvery-white pubescence, most dense on the former; the metathorax not distinctly enclosed at its base, but with two shallow impressed lines, which mark the form of the usual enclosed space; a central longitudinal channel extends from its base to the apex, slightly sub-interrupted in the middle; the wings hyaline and iridescent, the nervures dark fuscous; the anterior and intermediate tibiæ in front, their tarsi, the apical joints of the posterior pair, and the base of the tibiæ very pale ferruginous; the claw-joint of the intermediate and posterior tarsi fuscous above; the calcaria pale testaceous. Abdomen, the second, third, and base of the fourth segment more or less ferruginous; the apex of the basal petiolated joint ferruginous beneath.

Hab. Aru and Key Island.

Gen. CRABRO, *Fabr.*

1. CRABRO SOLITARIUS. *C. niger*; abdomine petiolato; scapo flagellique articulo ultimo, collari, tuberculis, postscutelli maculis duabus flavis; pedibus petioloque basi ferrugineis.

Female. Length 5 lines. Black and opaque; the head large, quadrate, and wider than the thorax; the ocelli in a curve on the vertex; the clypeus covered with silvery pubescence, carinated in the middle, and slightly produced; the scape and basal joint of the flagellum pale yellow. Thorax: an interrupted line on the collar, the tubercles, a spot beneath the wings, and two minute ones on the postscutellum yellow; the disk of the thorax longitudinally delicately rugose; the metathorax obliquely striated, with an enclosed space at its base, and having a central longitudinal channel, the sides covered with thin silvery pubescence; the wings hyaline and iridescent, the nervures fuscous; the legs ferruginous, variegated with yellow. Abdomen: the basal petiolated segment ferruginous, with its apical half black above; the apical segment with an angular shape at its base, which is smooth and shining, with its lateral margins carinate, the extreme apex ferruginous; beneath smooth and shining, with the apical margins rufo-piceous.

Hab. Aru.

This species would, according to the views of some Hymenopterists, belong to the genus *Rhopalum* of Kirby.

Group SOLITARY WASPS.

Fam. EUMENIDÆ, *Westw.*Gen. EUMENES, *Latr.*1. *Eumenes arcuata*, *Fabr. Syst. Piez.* 287. 11.*Hab.* Key Island; coast of New Guinea (Triton Bay); Australia.Gen. PACHYMENES, *Sauss.*1. *PACHYMENES VIRIDIS.* *P. lætè viridis*; facie pube argentato-albâ tectâ; alis hyalinis.

Female. Length 8 lines. Bright green; the head, thorax, and basal segment of the abdomen rugose, the rest of the abdomen finely and very closely punctured; the clypeus thinly covered with a fine silvery-white pubescence, its apex produced and truncate. Thorax: the metathorax rounded behind, a deep longitudinal impressed line in the middle, and with fine silvery down at the sides and behind; the wings subhyaline, with a fuscous stain along the anterior margin of the superior pair; the legs rufo-piceous; the coxæ, femora, and tibiæ more or less tinged with green.

Hab. Aru.Gen. RHYNCHIUM, *Spin.*1. *Rhynchium mirabile*, *Sauss. Mon. Guêpes Sol.* 106. 6, t. 14. f. 5 ♀.*Hab.* Aru; Tasmania.

The *Male* of this fine species closely resembles the female; it is black, with a transverse spot above the insertion of the antennæ, an abbreviated narrow line behind the eyes, another on the lower margin of their emargination; the scape in front and the clypeus yellow, the latter notched at its apex; a minute yellow spot at the base of the mandibles; the antennæ, tibiæ, apex of the femora, and the tarsi ferruginous; the basal joint of the intermediate and posterior tarsi dusky; the intermediate femora deeply excavated or hollowed beneath; the prothorax yellow above; the metathorax truncate, transversely striated with several minute teeth on the lateral margins; the wings hyaline, tinted with yellow, their apical margins slightly clouded; the apical margins of all the segments of the abdomen bordered with yellow, that on the first segment narrowest. The only particulars in which the female apparently differs from Saussure's description, is that the second fascia on the abdomen is *widest at the sides*, and there are *three little teeth* on each side of the margins of the metathorax.

The *Female* is also in the Paris Museum.2. *Rhynchium superbum*, *Sauss. Mon. Guêpes Sol.* p. 113. 18.*Hab.* Aru; New Holland.

Our example of this species slightly differs in coloration from the description of Saussure. He says, "black, with the vertex, the front, the prothorax, and the border of all the segments of the abdomen, except the first, yellow; the wings yellow;" in the Aru specimen, the sinus of the eyes, a spot above the clypeus, a reversed crescent-shaped spot crossing the ocelli, two oblique spots behind them, and a broad elongate stripe behind the eyes yellow. These slight differences cannot characterize more than a variety; in every other particular they exactly correspond.

Gen. ODYNERUS, *Latr.*

1. ODYNERUS PETIOLATUS. *O. niger*; clypeo apiculato; capite, thorace abdomineque flavo variis; abdomine petiolato; alis subhyalinis.

Female. Length $7\frac{1}{2}$ lines. Black; head and thorax strongly punctured; two confluent spots between the antennæ, a line on the inner orbits of the eyes, terminating in their emargination, an oblong spot behind them, a spot at the base of the mandibles, the scape in front, and the clypeus yellow; the latter with a large black spot in the middle, and with its anterior margin prolonged into an acute point; the mandibles ferruginous, with their base and margins black; the flagellum fulvous beneath. Thorax: an interrupted line on the collar, a spot beneath the wings, the outer margin of the tegulæ, two spots on the scutellum, two longitudinal curved lines on the metathorax, extending from the base to the apex, yellow; the yellow lines on the metathorax curving inwards. The tibiæ, tarsi, and apex of the femora ferruginous; the intermediate and posterior tibiæ with a fuscous line outside, a spot on the coxæ outside, a stripe at the apex of the anterior femora beneath, another on the intermediate pair, and a line on the anterior tibiæ, behind, yellow; wings subhyaline, their margins fuscous. Abdomen petiolated; a fascia on the apical margins of all the segments, and the petiole, yellow; the third and following fasciæ narrowest; all the fasciæ continued beneath the abdomen.

Hab. Aru.

2. ODYNERUS AGILIS. *O. niger*; capite thoraceque distinctè, abdomine delicatè punctatis; pedibus ferrugineis; abdominis segmentis duobus basalibus flavo fasciatis; alis subhyalinis.

Male. Length 6 lines. Black; the scape in front, a line on the inner margin of the eyes, terminating in their emargination, an abbreviated line behind them, and the clypeus yellow; the latter deeply emarginate, forming two teeth. Thorax: a line in the middle of the anterior margin of the prothorax, two spots on the verge of the emargination of the metathorax, and a fascia on the apical margins of the first and second segments of the abdomen yellow; the legs ferruginous; the wings subhyaline, the anterior margin of the superior pair fuscous; the outer margin of the tegulæ yellowish.

Hab. Aru.

3. *ODYNERUS MULTIPICTUS*. *O. niger*, flavo maculatus et punctatus; pedibus flavis, alis hyalinis.

Female. Length 4 lines. Black; the head and thorax strongly punctured, the abdomen finely and distantly so; the clypeus, a spot above it, the inner and outer orbits of the eyes, and the scape in front yellow; the clypeus deeply emarginate in front; the mandibles ferruginous, with a yellow spot at their base. Thorax: the prothorax in front, the tegulæ and two spots beneath the wings, the scutellum, and sides of the metathorax yellow; the legs yellow, with ferruginous stains; the femora with a black or dark stain above; wings hyaline, with a fuscous stain along the anterior border of the superior pair. Abdomen: a yellow fascia on the apical margins of the two basal segments; the three following segments with very narrow yellow borders, and the apical segment entirely reddish-yellow.

Hab. Aru.

4. *ODYNERUS MODESTUS*. *O. niger*; abdominis segmentis duobus basalibus flavo fasciatis; tibiis tarsisque ferrugineis; alis hyalinis; abdominis segmento primo basi transversim bicarinato.

Female. Length 4 lines. Black; head and thorax coarsely punctured; the vertex swollen; the scape of the antennæ, a spot between them, and the clypeus yellow; the latter with a transverse black spot in the middle, deeply notched in front, and having a carina on each side, in a line with the angle or tooth of the emargination; the flagellum ferruginous towards the apex beneath; wings hyaline, with a fuscous cloud in the marginal cell; the tibiæ and tarsi ferruginous. Abdomen: the base truncate, with an oblique space above the truncation, the margin of both defined by an elevated ridge or carina; a narrow fascia on the apical margin of the basal segment, and a broader one on the second; the latter continued beneath the abdomen.

Hab. Aru.

This species is undoubtedly allied to *O. Sichellii* of Saussure; but, beside differing in the colour of its legs, and of the bands of the abdomen, it wants the strong tubercle at the base of the second segment of the latter.

Gen. ALASTOR, *St.-Farg.*

1. *ALASTOR UNIFASCIATUS*. *A. niger*; maculâ inter antennas, abdominisque margine apicali et segmento secundo flavis; alis fuscis.

Female. Length $6\frac{1}{2}$ lines. Black; the head and thorax strongly punctured; the face, sides of the clypeus, cheeks, and base of the mandibles with a fine silky silvery-white pubescence; the clypeus convex, its anterior margin emarginate; from each angle of the emargination a shining carina runs more than halfway up the clypeus; a minute spot between the antennæ, and two on the anterior margin of the prothorax, yellow; the wings fuscous, palest at their posterior mar-

gins. Abdomen finely and closely punctured; the third segment strongly so; a broad yellow fascia on the apical margin of the second segment.

Hab. Aru.

2. *ALASTOR APICATUS*. *A. niger*; abdominis segmentis primo et secundo aurantiaco-rubris; alis fuscis.

Male. Length $5\frac{1}{2}$ lines. Black; the head and thorax strongly punctured; a spot between the antennæ, the scape in front, and the clypeus yellow; the latter with a large black spot at its base, anteriorly deeply emarginate; wings fuscous; the tegulæ with a rufo-testaceous spot at their outer margins; the tarsi and articulations of the legs ferruginous. Abdomen bright orange-red, with the third and following segments black; the base rugose, the second segment finely punctured, the rest much more strongly so.

Hab. Aru.

Group SOCIAL WASPS.

Fam. VESPIDÆ, *Steph.*

1. *ISCHNOGASTER IRIDIPENNIS*. *I. rufescenti-fuscus flavo varius*; vertice et metathorace nigris, alis subhyalinis et pulcherrimè iridescentibus.

Male. Length $7\frac{1}{4}$ lines. Head yellow, above the insertion of the antennæ black; antennæ black, with the scape, basal joint of the antennæ, and the mandibles ferruginous; the flagellum obscurely ferruginous beneath; the clypeus produced at the apex into an acute tooth. Thorax pale ferruginous; the metathorax black, with a ferruginous spot on each side in front; the scutellum with a reddish-brown spot in the middle, the postscutellum yellow and subinterrupted in the middle; the sides of the thorax yellow anteriorly, the yellow portion with two black spots; the legs slightly variegated with yellow; wings subhyaline and brilliantly iridescent, the marginal cell with a fuscous cloud. Abdomen brown; the petiole pale testaceous at its apex and ferruginous beneath, longer than the head and thorax; the second segment has a yellow macula on each side, and, beneath, a smaller spot on each side in a line with the side spots; the first segment has its basal portion yellow beneath, and a blackish spot in the centre rather behind the middle.

Hab. Aru.

This species in many particulars agrees with the *I. nitidipennis* of Saussure, but differs in too many, I think, to be considered the same species; the second recurrent nervure is straight at the upper extremity, then curved towards the margin of the wing, and again straight at its lower extremity; the third submarginal cell is much wider than the fourth.

Gen. ICARIA, Sauss.

1. *Icaria maculiventris*, Sauss. *Mon. Guêpes Soc.* p. 23. 1.—*Rhopalidia maculiventris*, Guér. *Voy. Coq. Zool.* ii. pt. 2. *Ins.* p. 267, pl. 9. fig. 8.
Hab. Aru; New Guinea.

2. *ICARIA NIGRA*. *I. nigra*; clypeo anticè angulato; metathorace concavo et transversim striato; alis hyalinis.

Female. Length 6 lines. Black, punctured and opaque; the clypeus terminating in a sharp-pointed angle; the base and apex of the mandibles rufo-piceous; the scape ferruginous in front; the face with a thin, fine, griseous pubescence. Thorax slightly margined in front; an obscure testaceous spot on each side of the postscutellum, the metathorax concave and transversely striated; wings hyaline. Abdomen with a short petiole to the basal segment, which is very short and campanulate; at its posterior margin are two minute, obscure, pale spots; beneath, the margins of the apical segments are rufo-piceous.

Hab. Aru.

3. *ICARIA FASCIATA*. *I. nigra*; clypei margine antico, maculis duabus postscutelli flavis; segmentis abdominis ad apicem flavo angustè fasciatis.

Female. Length 5 lines. Black; the clypeus angular in front, its anterior margin and a spot on the mandibles yellow; the antennæ rufo-testaceous beneath. Thorax: the anterior margin of the prothorax slightly rebordered; the anterior coxæ with a spot in front and two spots on the postscutellum yellow; the anterior and intermediate tibiæ beneath, the tarsi beneath and the claw-joint entirely, ferruginous; wings hyaline with a fuscous stain along the anterior margin of the superior pair; the metathorax oblique and slightly concave, with an acute stout tooth on each side. Abdomen: the basal segment campanulate, the petiole short; a narrow yellow fascia on the apical margin of all the segments.

Hab. Aru.

4. *ICARIA BRUNNEA*. *I. rufescenti-fusca*; coxis femoribusque obscuris; alis hyalinis.

Female. Length $3\frac{1}{2}$ lines. Reddish-brown; head and thorax punctured, the abdomen finely rugose; the clypeus and mandibles pale ferruginous, the former with a darker spot in the middle, the anterior margin angular. The anterior margin of the prothorax slightly rebordered; the wings hyaline and iridescent, with a fuscous stain along the anterior margin of the superior pair; the metathorax abruptly truncate. Abdomen: the basal margin of the third and following segments black.

Hab. Aru.

5. *ICARIA GRACILIS*. *I. nigra* flavo variegata; abdominis segmento basali elongato, gracili et petiolato; alis hyalinis.

Female. Length 7 lines. Black; the scape in front, the sides and apical margin of the clypeus, and a spot at the base of the mandibles yellow; the cheeks reddish-yellow; the antennæ ferruginous; the head covered with short griseous pubescence. Thorax with obscure ferruginous tints and a short griseous pubescence, most dense on the sides and beneath; the anterior margin of the prothorax, the tegulæ, scutellum and postscutellum, a broad stripe on each side of the metathorax, the coxæ, and the anterior and intermediate femora, at their apex beneath, yellow; the scutellum with a ferruginous stain in the middle, the postscutellum with a black stain, the coxæ ferruginous above, the tibiæ and tarsi ferruginous beneath; wings hyaline, with a fuscous stain along the anterior margin of the superior pair. Abdomen: a yellow fascia on the apical margin of the first and second segments; that on the following segments rufo-testaceous.

Hab. Aru.

6. *ICARIA UNICOLOR.* *I. rufescenti-fusea*, tenuiter cinereo-pubescent.

Female. Length 5 lines. Reddish-brown, covered with a thin cinereous pubescence; the clypeus acutely angular anteriorly; the metathorax oblique and delicately striated transversely; wings fusco-hyaline; the petiole of the abdomen long, the segment campanulated and narrow.

Hab. Key Island.

Gen. *POLISTES*, *Latr.*

1. *Polistes tepidus*, *Fabr. Syst. Piez.* p. 271. 7.

Hab. Aru; Key Island; Solomon Islands; New Guinea; Australia.

2. *Polistes diabolicus*, *Sauss. Mon. Guêpes Soc.* 68. 26. t. 6. f. 7.

Hab. Aru; Java; Timor.

3. *Polistes stigma*, *Fabr. Syst. Piez.* p. 261. 41.

Hab. Aru; Celebes; Ceram; India.

Var. The specimens from Aru differ from the typical ones in wanting the two longitudinal yellow lines on the metathorax, which is entirely black. Saussure has a variety with the metathorax black between the lines; of two examples from Celebes, one has the yellow lines entire, the other has them abbreviated at half their length.

4. *POLISTES NIGRIFRONS.* *P. capite thoraceque nigris, flavo et ferrugineo variegatis; abdomine ferrugineo, segmentis basi nigris, marginibus apicalibus flavis.*

Female. Length 8 lines. Head and thorax black; the anterior margin of the clypeus angular and narrowly rufo-testaceous; the mandibles, palpi, and antennæ ferruginous; the scape, and flagellum above, except the basal joint, fuscous; the outer orbits of the eyes with a narrow yellow line. The anterior margin of the prothorax slightly rebordered, the posterior margin ferruginous; the outer margin of the tegulæ reddish-yellow; wings subhyaline with a fusco-ferruginous stain along the anterior margins of the superior pair; the metathorax

finely striated transversely, and with two yellow stripes running upwards halfway from the base, the posterior margin of the pectus, tips of the coxæ, the femora at their base and apex, the tibiæ and tarsi beneath, ferruginous; tips of the femora, and tibiæ above, yellowish. Abdomen ferruginous, with the base of the second and following segments black; the first and three following segments with a yellow fascia on their apical margins; beneath, the two basal segments entirely ferruginous.

Hab. Aru.

This species is closely allied to the *P. fastidiosus* of Saussure, and, notwithstanding the difference in colouring, may possibly, I think, be an extreme variety of that species.

5. *POLISTES ELEGANS*. *P. ferrugineus*; capite thoraceque flavo variis; segmentis abdominis flavo marginatis.

Female. Length 8 lines. Ferruginous; the clypeus, mandibles, cheeks, and the face, as high as the middle of the emargination of the eyes, yellow. Thorax: the margins of the prothorax, two longitudinal stripes on the mesothorax, the scutellum, postscutellum, and sides of the metathorax broadly, yellow; the legs beneath, the coxæ and the sides of the thorax spotted with yellow; the intermediate and posterior coxæ spotted with ferruginous or fusco-ferruginous; the metathorax finely striated transversely; the wings hyaline with the nervures ferruginous. Abdomen: the first and three following segments with yellow marginal fasciæ, that on the fourth usually more or less obliterated.

Hab. Aru; Key Island.

Fam. EVANIDÆ, *Leach.*

Gen. FÆNUS, *Fabr.*

1. *FÆNUS GRACILIS*. *F. niger*, facie lateribusque thoracis argenteo pilosis; pedibus anticis et intermediis pallidè -rufo-testaceis, tibiis posticis basi tarsisque albis; abdomine subtùs rufo-testaceo.

Female. Length 6 lines. Black; sub-opake; the face, sides of the thorax and beneath with silvery pubescence; the mandibles, palpi, and scape in front rufo-testaceous. Thorax: the anterior and intermediate legs rufo-testaceous, the femora having a darker stain above; the posterior legs black, with the base of the tibiæ and the tarsi white. Abdomen rufo-testaceous beneath; the ovipositor white at its apex.

Hab. Aru.

Gen. STENOPHASMUS.

Head globose; antennæ longer than the body, and very slender and setaceous; the prothorax forming a slender neck; the anterior wings with one marginal and three submarginal cells; the femora slightly

incrassate, not denticulate; the tarsi 5-jointed. Abdomen petiolated, the petiole as long as the abdomen; the ovipositor as long as the petiole and abdomen united.

This genus is founded on the examination of a single individual, which in general appearance exactly resembles the smaller species of the genus *Megischus*; on examination, however, it will be found that it differs from that genus in the neuration of the anterior wings; its femora are not denticulate, in which character it differs from both *Megischus* and *Stephanus*; with the latter genus it agrees in having 5-jointed tarsi.

1. *STENOPHASMUS RUFICEPS*. *S. niger*; capite et antennarum basi rufis; ovipositore tarsisque pallidè testaceis; petiolo abdominis cylindrico; alis subhyalinis.

Female. Length 5 lines. Black, slightly shining; head globose, red and sprinkled with white hairs, and delicately striated transversely. Thorax sprinkled with white pubescence above, the sides more thickly clothed with the same; above, the thorax is transversely rugose, on the metathorax becoming more regularly striate; the metathorax has a central longitudinal carina and also one on each side; the legs sprinkled with erect white hairs; the tarsi pale rufo-testaceous with the claw-joint black; wings subhyaline, with a broad light-fuscous stain along the centre of the anterior pair; a hyaline streak crosses them at the base of the stigma. Abdomen: the petiole as long as the thorax, narrowest at the base of the abdomen; it is rugose at the base; the ovipositor pale testaceous.

Hab. Aru.

Fam. ICHNEUMONIDÆ, *Leach*.

Gen. ICHNEUMON.

1. *ICHNEUMON INSULARIS*. *I. niger*; capite thoraceque albo variegatis; abdominis segmentorum primo, secundo tertioque albo maculatis.

Length $7\frac{1}{2}$ lines. Black; the orbits of the eyes, the face before the antennæ, the mandibles and palpi yellowish-white; the flagellum with the joints from the 14th to 25th white. Thorax: a line on each side before the tegulæ, a spot beneath the wings, two at the sides of the pectus, the anterior coxæ in front, and a narrow line on each side of the scutellum yellowish-white; the anterior and intermediate legs and a spot beneath the posterior tibiæ rufo-testaceous; the wings hyaline, the nervures black. Abdomen: a minute spot at the lateral apical margins of the three basal segments, and a large central one on the two apical segments, white.

Hab. Key Island.

Gen. CRYPTUS, *Fabr*.

1. *CRYPTUS SCUTELLATUS*. *C. ferrugineus*; tibiis posticis tarsisque albo annulatis; scutello tuberculato.

Female. Length 5 lines. Ferruginous; the face testaceous-yellow, an elongate black spot on the vertex enclosing the ocelli and extending to the insertion of the antennæ; the latter black, with the scape ferruginous in front. Thorax: the scutellum elevated, forming a compressed tubercle, its side view wedge-shaped; the wings hyaline the nervures black, the base of the wings yellowish; the apical joints of the intermediate tarsi, the tips of the posterior femora, the extreme base of the tibiæ, their apical half, and the tarsi black; the intermediate portion of the tibiæ yellow; the apical segment of the abdomen black.

Hab. Aru.

Gen. *MESOSTENUS*, *Grav.*

1. *MESOSTENUS PICTUS*. *M. niger*; capite thoraceque flavo striatis et punctatis; pedibus flavis nigro et ferrugineo lavatis; segmentis abdominalibus flavo marginatis; alis hyalinis.

Female. Length 8 lines. Black; a large ovate spot on the cheeks touching the mandibles, the labrum, palpi, inner orbits of the eyes, and from the 7th to the 10th joints of the antennæ yellowish-white. Thorax: an ovate spot in the middle of the disk of the mesothorax, the tegulæ, a spot beneath them, two larger spots beneath the wings, the scutellum, a spot on the postscutellum uniting with another at the base of the metathorax, a trilobed spot at its apex, and a subovate one on each side yellowish-white; the coxæ white with black stains on the intermediate and posterior pairs; the femora white beneath, the anterior and intermediate pairs with a black line above, the posterior pair ferruginous above; the tibiæ and tarsi whitish beneath, stained more or less fusco-ferruginous above; wings hyaline. Abdomen: all the segments with yellowish-white fasciæ on their apical margins, the fasciæ continued beneath; the ovipositor about the length of the abdomen, the valves broadest at their apex.

Hab. Aru.

2. *MESOSTENUS AGILIS*. *M. niger*; antennis medio albis; thorace pedibusque albo variegatis; abdominis marginibus fasciis albis.

Female. Length 5 lines. Black; the joints of the antennæ, from the 6th to 13th, white, the vertex also white. Thorax: a spot in the middle of the disk of the mesothorax, the scutellum, a spot on the postscutellum, two beneath the wings, the apex of the metathorax, and a spot on each side white; the legs white, the anterior pair slightly fuscous above; the intermediate femora and tibiæ beneath, and the tarsi above, black; the posterior femora above and beneath the tibiæ, except their extreme base and the base and apex of the tarsi, black; wings hyaline, the nervures black. Abdomen: the apical margins of the segments, excepting the fourth and fifth, with white fasciæ, the second and third fasciæ attenuated in the middle.

Hab. Aru.

3. *MESOSTENUS ALBOPICTUS*. *M. niger*, albo varius; alis hyalinis.

Female. Length 7 lines. Black; the clypeus, mandibles, palpi, the joints of the antennæ from the sixth to the thirteenth, and a broad stripe at the inner orbits of the eyes white. Thorax: an ovate spot on each side of the prothorax above, a similar spot in the middle of the mesothorax, the tegulæ, scutellum and postscutellum, a T-shaped spot reversed on the metathorax, a large quadrate one on its sides, three irregular-shaped maculæ beneath the wings, and the anterior and intermediate legs white, the legs with a black line above; the posterior legs have a large spot on the coxæ behind, the trochanters, the tibiæ, and tarsi white, the tibiæ black at their apex, and the femora palish at their base outside; the wings hyaline and iridescent, with the nervures black. The abdomen beneath, and the apical margins of the segments above, white.

Male. Rather smaller than the female, but only differs otherwise in the colour of the legs, the anterior and intermediate pairs being entirely yellowish-white, excepting the intermediate tibiæ and tarsi, which are slightly fuscous above; the posterior femora are ferruginous, the tibiæ and tarsi white, with the base and apex of the two former black as well as the apical joint of the tarsi.

Hab. Key Island.

Gen. *PIMPLA*, *Fabr.*

1. *PIMPLA OCHRACEA*. *P. ochracea*; antennis ferrugineis; facie luteâ; alis hyalinis, apice fuscis.

Female. Length 5 lines. Entirely ochraceous, with the face and scape in front yellow; the body beneath is pale ochraceous; the antennæ ferruginous, above dusky; the eyes emarginate within; the tarsi have the tips of the claws black; the wings flavo-hyaline, with the apex of the anterior pair fuscous, the nervures black, becoming yellow at the base of the wings. The head, thorax, legs, and base of the abdomen smooth and shining; the abdomen, except the base, finely punctured; a transverse impressed row of punctures a little before the apical margin of each segment, and the space between impunctate.

Hab. Aru.

2. *PIMPLA BRACONOIDES*. *P. rufo-flava*; antennis tarsisque et abdominis dimidio posteriori nigris; alis fuscis, dimidio basali flavis.

Female. Length 6 lines. Ferruginous; the posterior tarsi and the fourth and following segments of the abdomen black; the head is reddish yellow, the eyes brown; the scape and two or three of the basal joints of the flagellum ferruginous, the rest fuscous; the basal half of the wings flavo-hyaline, the apical half fuscous; the stigma yellow, with a subhyaline macula beneath, and two other similar irregular-shaped spots. The abdomen with two longitudinal carinæ

on the basal segment, and a transverse curved impressed line on the other segments.

Hab. Key Island.

This species might at first sight be mistaken for a species of the genus *Bracon*. The male only differs from the female in having the abdomen black, with only the basal segment yellow; the wings are only very slightly yellow at their base; it is also rather smaller.

3. *PIMPLA PENETRANS*. *P. flavo-ferruginea*; flagello fusco; alis flavo-hyalinis, apice fuscis.

Female. Length $4\frac{1}{4}$ lines. Reddish yellow, smooth, and shining; the face testaceous, with slight fuscous stains; the scape and two or three of the basal joints of the flagellum yellow in front; the wings hyaline, with a yellowish tinge; the nervures black, except the costal nervure, which is ferruginous towards the base, the apex of the wings slightly clouded; the posterior tibiæ fuscous above. Abdomen: the segments with slightly impressed oblique depressions, the ovipositor shorter than the abdomen, and black.

The *Male* only differs in having the abdomen rather more slender.

Hab. Aru.

4. *PIMPLA FERRUGINEA*. *P. flavo-ferruginea*; antennis supra fuscis; alis hyalinis.

Female. Length $5\frac{1}{2}$ lines. Ferruginous, with the head and thorax beneath yellow-testaceous; the coxæ also are of the same colour; the flagellum slightly fuscous above; the wings flavo-hyaline, the nervures black; the two basal segments of the abdomen shining, the third and the following segments subopaque; the ovipositor as long as the abdomen.

Hab. Key Island.

5. *PIMPLA PLAGIATA*. *P. flavo-rufa*; antennis strigisque tribus mesothoracis nigris; alis hyalinis, apice cellulæ marginalis fusco unimaculato.

Female. Length $5\frac{1}{2}$ lines. Yellow, the legs with ferruginous stains; the antennæ black, with the scape yellow in front; the head with a large ovate black spot behind the ocelli. Thorax finely punctured on the disk of metathorax, which has three longitudinal broad black stripes, a narrow black line on the posterior margin of both the scutellum and postscutellum; wings hyaline, the nervures black, with a dark fuscous spot at the apex of the marginal cell. Abdomen reddish-yellow, with the apical margins of the segments yellow; the ovipositor black, and shorter than the abdomen.

Hab. Aru.

Gen. RHYSSA, Grav.

1. *RHYSSA MACULIPENNIS*. *R. rufescenti-flava*; antennis et vertice nigris; alis hyalinis, plaga nigro-fusca.

Male. Length 9 lines. Ferruginous; the head of a yellow testaceous, with the vertex and antennæ black; the scape ferruginous in front; the mandibles black. Thorax: the mesothorax and scutellum transversely rugose, the former with two deeply impressed lines in front, which converge inwards, and meet in the middle of the disk; wings hyaline, with a yellow tinge on the anterior pair, the nervures black; a black stripe crosses the middle of the marginal cell, and terminates at the inferior margin of the discoidal cell; the legs ferruginous, with the posterior tarsi black. Abdomen smooth, shining, ferruginous.

Hab. Aru.

2. *RHYSSA VESTIGATOR.* *R. ferruginea*; *antennis, mesothorace, metathoracisque basi nigris*; *abdomine lineari, nitido et lævi*; *alis hyalinis, apice subfuscato.*

Male. Length 9 lines. Head testaceous-yellow, with the vertex ferruginous; the antennæ fusco-ferruginous. Thorax black, with the prothorax, a large oblique spot beneath the wings, the scutellum, and metathorax yellow, the base of the latter black; the mesothorax and scutellum rugose; the metathorax smooth and shining; the legs ferruginous, with the anterior coxæ in front and the posterior pair behind yellow; the posterior coxæ black beneath; wings hyaline, faintly clouded at their apical margins. Abdomen elongate, linear, glossy, smooth, and shining, ferruginous, with the base and lateral margins blackish.

Hab. Aru.

Gen. *BRACON*, *Fabr.*

1. *BRACON BASALIS.* *B. capite, thorace, pedibus anticis et intermediis, femoribus posticis ferrugineis*; *tibiis tarsisque et abdomine nigris, segmento basali flavo*; *alis fusco-hyalinis.*

Female. Length $4\frac{1}{4}$ lines. The head, scape in front, thorax, anterior and intermediate legs, the posterior coxæ, trochanters, and femora, and the first segment of the abdomen, and a semicircular spot in the middle of the base of the second, yellow-ferruginous; the antennæ, the posterior tibiæ and tarsi, fuscous; abdomen shining black; the thorax smooth and shining; the wings fusco-hyaline. The basal segment of the abdomen with a longitudinal impressed line on each side, the second segment with an oblique depression, the third with an impressed line, curved forwards and extending to the lateral margins; the base of the segment has a row of short, deeply impressed striæ; the ovipositor shorter than the abdomen.

Hab. Aru.

2. *BRACON ALBO-MARGINATUS.* *B. capite, thorace pedibusque ferrugineis*; *abdomine nigris annulis albo-marginatis*; *alis fusco-hyalinis.*

Female. Length $4\frac{1}{2}$ lines. Head, thorax, and legs ferruginous, smooth, and shining; antennæ and abdomen black, the latter smooth and

shining, the posterior margins of the third and following segments with a narrow bluish-white fascia; the posterior tarsi slightly fuscous; the wings fusco-hyaline; the ovipositor a little longer than the abdomen.

Hab. Aru.

3. *BRACON NIGRIPENNIS*. *B.* thorace, pedibus anticis et intermediis, femoribusque posticis ferrugineis; tibiis tarsisque posticis et abdomine nigris; alis nigro-fuscis; capite luteo-testaceo.

Female. Length 9 lines. Head testaceous, the antennæ black. Thorax, anterior and intermediate legs, the posterior coxæ, trochanters and femora, the tegulæ, extreme base of the wings, and the base of the stigma ferruginous; the thorax smooth and shining; the wings brown-black, with a small hyaline spot in the first submarginal cell. Abdomen longitudinally aciculate, a central carina at the base of the first segment, the second segment with an oblique impressed line running from the lateral angles of its basal margin, and meeting in the centre of its posterior margin; the margins of all the segments constricted; the ovipositor shorter than the abdomen.

Hab. Aru.

4. *BRACON EXOLETUS*. *B.* niger; capite, thorace, pedibus anterioribus et intermediis ferrugineis; alis subhyalinis.

Female. Length 5 lines. Head, scape of the antennæ, thorax, anterior and intermediate legs, ferruginous; flagellum and tips of the mandibles black. Thorax smooth and shining; wings fusco-hyaline, the nervures dark brown; the posterior legs fusco-ferruginous. Abdomen rugose and subopaque; the basal segment black in the middle, with the base and lateral margins ferruginous, the sides deeply channeled; the second segment with an arrow-headed shining space in the middle of its base; the ovipositor shorter than the abdomen.

Hab. Aru.

5. *BRACON ABDOMINALIS*. *B.* rufo-flavus; antennis fuscis; alis subhyalinis; abdomine ovato.

Female. Length 3 lines. Reddish yellow; head and thorax smooth and shining; the head narrower than the thorax; wings fusco-hyaline; abdomen ovate, broader than the thorax, the first and second segments rugose, with deep sculptured impressions; the second segment has an ovate shining space in the middle at its basal margin; the third segment is deeply depressed and sculptured at the base, leaving a transverse arched space at its apex, the width of the entire segment; the following segments have their margins very deeply depressed.

Hab. Aru.

6. *BRACON NITIDUS*. *B.* niger; capite, thorace pedibusque et abdominis segmento primo ferrugineis, totis nitidissimis.

Female. Length 4 lines. Ferruginous, with the flagellum, second and

following segments shining black; the thorax smooth and shining, with the scutellum prominent; the wings subhyaline, their apical margins clouded, their extreme base yellowish, the nervures dark brown, the stigma black. Abdomen: the second and third segments with deeply impressed oblique lines on each side, and the basal margins of the following segments depressed.

Hab. Aru.

7. *BRACON PALLIFRONS.* *B. niger*; thorace pedibusque anticis et intermediis ferrugineis; alis fuscis.

Female. Length 6 lines. Head obscure, testaceous yellow; the eyes brown; the antennæ black. Thorax and the anterior and intermediate legs ferruginous; an ovate black spot on the metathorax; and the posterior legs black, with the articulations obscurely ferruginous; wings dark fuscous, with the nervures and stigma black, the base of the latter yellowish, and a hyaline streak beneath it, which crosses the first submarginal cell. Abdomen black and shining; the first segment with some coarse striæ at the apex; the second with a central forked carina and an oblique one on each side running inwards to the apex of the segment; between the carinæ are a number of deep grooves; the lateral margins of the three basal segments carinated; the third segment has a row of short deep striæ at its base; the ovipositor longer than the body.

Hab. Aru.

8. *BRACON INTRUDENS.* *B. niger*; thorace, pedibus anticis intermediisque et abdominis segmento basali ferrugineis; alis hyalinis.

Female. Length 5 lines. Black; the thorax, anterior and intermediate legs, the articulations of the posterior pair, and the base of the abdomen ferruginous, entirely smooth and shining; the wings subhyaline, the nervures fusco-ferruginous, an irregular fuscous stain at the base of the first submarginal cell, extending beyond it. Abdomen: the basal segment margined at the sides; the second segment with an oblique deeply impressed line running inwards, not quite meeting or extending to the apical margin.

Hab. Aru.

Gen. *AGATHIS*, *Latr.*

1. *AGATHIS FUMIPENNIS.* *A. ferruginea*; capite, abdominis apice tarsisque posticis nigris; alis obscure fuscis.

Female. Length 4 lines. Reddish-yellow; the head, apical joint of the intermediate tarsi, the apex of the posterior tibiæ, and the third and following segments of the abdomen black; the thorax and legs with a thin, short, pale fulvous pubescence; the head and abdomen smooth and shining; the head produced before the eyes into a kind of beak, rufo-piceous anteriorly. Thorax narrowed before the wings, which are dark fuscous, with a hyaline irregular mark below the

stigma, crossing the submarginal cell; the anterior margin of the anterior wings pubescent; the metathorax broad, margined laterally, with a central forked carina, and a crooked one on each side; the posterior legs incrassate. Abdomen with the sides of the upper surface carinated.

Hab. Aru.

Fam. CHRYSIDIDÆ, *Leach.*

Gen. STILBUM, *Spin.*

1. *Stilbum splendidum*, *Fabr. Syst. Piez.* p. 170. 1.

Hab. Aru; Senegal; Java; Bengal.

2. *Stilbum amethystinum*, *Fabr. Syst. Piez.* p. 176. 32.

Hab. Aru; Australia.

Fabricius includes this insect in the genus *Chrysis*; the typical specimen, however, proves that it belongs to the more modern genus *Stilbum*: it is very distinct from *S. splendidum*, being much more strongly and coarsely punctured; and the teeth which arm the apical segment are differently disposed on the margin.

Fam. TENTHREDINIDÆ, *Leach.*

Gen. ORYSSUS, *Fabr.*

1. *ORYSSUS MACULIPENNIS*. *O. niger, punctatus*; pedibus ferrugineis; alis fuscis fasciâ hyalinâ ante cellulam marginalem sitâ.

Female. Length $5\frac{1}{2}$ lines. Black; the head rugose, the front coarsely so, with a row of transverse tubercles running from the vertex along the inner orbits of the eyes, and crossing the front at half their length; the cheeks with a cinereous down, and a line of silvery-white pubescence or down, along the outer orbits of the eyes. Thorax coarsely punctured; the mesothorax with a central longitudinal smooth elevation; wings fuscous, with a broad transverse hyaline fascia before the base of the marginal cell, the tips of the wings hyaline; the legs ferruginous, with the coxæ and trochanters black; the posterior tibiæ with a double row of serrations outside. Abdomen shining and closely punctured; the base and apex coarsely so.

Hab. Aru.

Gen. XYPHIDRIA, *Latr.*

1. *XYPHIDRIA RUFIPES*. *X. nigra*; mandibulis, antennarum scapo, pedibusque ferrugineis; alis hyalinis et iridescentibus.

Female. Length 4 lines. Black and shining; the vertex highly polished; the front from the posterior ocelli forwards closely punctured and opaque; the mandibles, scape, and basal joint of the flagellum ferruginous. The thorax anteriorly punctured and opaque, posteriorly shining, and with a few punctures at the base of the scutellum; wings hyaline and iridescent, the nervures black, the extreme base of the wings and the

tegulæ pale testaceous; the legs pale ferruginous, with the claws of the tarsi darker. Abdomen: the base of the segments depressed and very delicately and closely punctured, subopaque; the apical half highly polished and shining; beneath obscurely rufo-piceous.

Hab. Aru.

Gen. TREMEX, *Jurine*.

1. TREMEX INSIGNIS. *T. nigro-purpureus*; abdominis fasciis basalibus albis; alis nigris cupreo nitentibus.

Female. Length 11 lines. Obscure steel-blue, with shades of green, purple, and violet; the head and thorax punctured; the prothorax with an oblique smooth shining space on each side; the wings very dark brown, with a brilliant coppery effulgence. The base of the abdomen opaque, velvety, purple-black; the first segment with a transverse cream-coloured fascia in the middle, the second very slightly whitish at its base; the rest of the abdomen is highly polished, and has a scattered, short, black pubescence.

Hab. Aru.

Note on Two Insect-products from Persia.

By DANIEL HANBURY, Esq., F.L.S.

[Read December 16th, 1858.]

IN the month of June last, my friend Professor Guibourt, of Paris, laid before the Académie des Sciences* some account of a remarkable substance called *Tréhala*, the cocoon of a Curculionidous insect found in Persia, where, as well as in other parts of the East, it enjoys some celebrity as the basis of a mucilaginous drink administered to the sick.

Specimens of this substance, as well as of another insect-product of Persia, together with the insects themselves, were presented a few years ago to the British Museum by W. K. Loftus, Esq., who obtained them while engaged by the British Government on the question of the Turco-Persian boundaries.

The precise determination of the species of these insects being a matter of doubt, they have at my request been lately examined by M. Jekel, of Paris, an entomologist with whom the family of *Curculionidæ* has long been an especial study. One of these insects M. Jekel has identified with a species of wide distribution; the other proving undescribed, he has drawn up a description of it, which, accompanied by a figure, I have the honour to lay before the Linnean Society. To this, I venture to add a few observations upon the productions to which I have alluded.

* Comptes Rendus, 21 Juin, 1858, p. 1213.

The first of these is *Tréhala* or *Tricala*, under which name it formed part of the Collection of Materia Medica sent by M. Della Sudda, of Constantinople, to the Paris Exhibition of 1855, and since deposited in the Ecole de Pharmacie in Paris.

Tréhala (fig. 2) consists of cocoons of an ovoid or globular form, about $\frac{3}{4}$ of an inch in length; their inner surface is composed of a smooth, hard, dusky layer, external to which is a thick, rough, tuberculated coating of a greyish-white colour and earthy appearance. Some of the cocoons have attached to them the remains of the tomentose stalk of the plant upon which they were formed; others have portions of a tomentose spiny leaf built into them; and, more rarely, one finds portions of the flowering heads of the plant, a species of *Echinops*, similarly enclosed. Many of the cocoons are open at one end and empty; others have a longitudinal aperture, originally closed by the stalk of the plant, and still contain the insect; a few are entirely closed. Specimens of this insect, extracted from the cocoons sent to Paris, were examined in 1856 by my friend Mr. W. Wilson Saunders, who pronounced them to be *Larinus maculatus* of Faldermann,—a determination also arrived at by M. Jekel from specimens presented by Mr. Loftus to the British Museum. Respecting these latter, one of which is represented in fig. 1, M. Jekel makes the following remarks:—

“*LARINUS MACULATUS*, Faldermann, *Faun. Transcauc.* ii. p. 228, 449, tab. 6. f. 10, et iii. p. 198.—*Schönh. Gen. et Sp. Curcul.* iii. p. 112 et vii. 2. p. 7.—Hochhuth, *Bull. Moscou*, 1847, No. 2. p. 538 (var. γ).

“Var. γ . *Larin. Onopordinis*, Sch. *loc. cit.* iii. p. 111 (excl. synonym.).

“Of this species, Mr. Loftus captured several specimens, all of small size: from some of them the pollinosity had been rubbed off, as is represented in the figure by Mr. Ford (*vide* fig. 1), which shows only a part of the inferior layer of tomentum and the greyish ground of the dorsal and lateral maculæ; the latter, being the most densely coloured in fresh specimens, are always the most persistent. These belong to Schönherr’s var. γ , which that author formerly regarded as the *Larinus Onopordinis*, Fabr. Others of Mr. Loftus’s specimens, which are very fresh, belong to var. β ; none to the typical variety, which is often larger in size.

“This species has a very extended habitat: I have received it from European Turkey (Frivaldski), Beyrouth, Caucasus, Persia (Dupont), &c. &c.; and it is recorded by Schönherr as also found in Barbary and Portugal.

“This is the insect which proceeds from the rough chalky-looking nidus figured by Mr. Ford. (*Vide* fig. 2.)”

The entomological question being so far disposed of, I may be permitted a few remarks upon the properties which have obtained for *Tréhala* a place among drugs and dietetic substances.

The first author who gives any account of the substance is Father Ange, who, in his 'Pharmacopœa Persica*,' describes it in the following terms:—"Est autem istud medicamentum veluti *tragea* ex nucleo pistacii integro confecta; nam revera saccharum istud exterius corrugatum et agglomeratum adhæret cuidam nucleo, in quo non fructus, sed vermiculus quidam nigricans Persice *C-hezoukek* bombycis instar reconditur et moritur."

Father Ange also states that the substance is called in Persian *Schakar tigel* (شکر تیغال), literally *Sugar of nests*; but his Arabic names, *Schakar el ma-ascher* (شکر المعشر) and *Saccar el aschaar*, apply to an entirely different substance, namely to a saccharine matter exuded, after the punctures of an insect, from the stems of *Calotropis procera*, R. Br.†, of which plant he gives a quaint but tolerably characteristic description.

Mr. Loftus, who obtained the specimens which he presented to the British Museum, at Kirrind in Persia, in September, 1851, gives as the Persian name of the cocoons *Shek roukeh*—a term, probably, the same as the "*C-hezoukek*" (a misprint?) of Father Ange, but the signification of which I have not been able to discover.

Another notice of the same substance, with a figure, is briefly given in Dr. Honigberger's 'Thirty-five Years in the East' (Lond. 1852, vol. ii. pp. 305-6), where we read that *Manna teeghul* or *Shukure teeghal*, which are certain insect-nests of a hard texture, rough on the outside, smooth within, about half an inch in length, and of a whitish colour, are imported into Lahore from Hindostan.

M. Bourlier published in 1857 an interesting note on the same substance‡, which has been followed by M. Guibourt's commu-

* Pharmacopœa Persica ex idiomate Persico in Latinum conversa. Lutet. Paris., 1681, p. 361.

† This saccharine substance is noticed by Avicenna as *Zuccarum alhusar* (Lib. ii. Tract. ii. cap. 756, ed. Valgr. Venet. 1564), and also by Matthioli (Comm. in Lib. ii. Diosc. cap. 75). It is likewise referred to by Endlicher (Enchiridion Botanicum, p. 300), Royle (Illustr. of the Bot. of the Himalayan Mountains, vol. i. p. 275), Merat and De Lens (Dict. de Matière Médicale, t. i. p. 467), &c.

‡ Revue Pharmaceutique de 1856, par Dorvault, p. 37.

nication to the Académie des Sciences, and still later by a memoir on the chemical history of Tréhala, by M. Marcellin Berthelot, also presented to the Academy*.

From the investigations of M. Guibourt, it appears that the cocoons are composed of a large proportion of starch (identical with that found in the stem of the *Echinops*, upon which the insect forms its nest), of gum, a peculiar saccharine matter, a bitter principle, besides earthy and alkaline salts.

The saccharine principle, which has been especially examined by M. Berthelot, and named by him *Tréhalose*, is a body analogous to cane-sugar, but possessing distinctive properties, which separate it from that and all other varieties of sugar.

M. Bourlier states that *Tréhala*, which is abundant in the shops of the Jew drug-dealers of Constantinople, is frequently used by the Arab and Turkish physicians in the form of a decoction, which is regarded by them as of peculiar efficacy in diseases of the respiratory organs.

The second insect-product to which I would draw attention, is a saccharine substance resembling dark honey. Mr. Loftus, who obtained it near Kirrind, 13th July, 1851, and whose specimen is in the British Museum, states that it is exuded from a species of thistle when pierced by a Rhynchophorous insect; but he fails to inform us for what purposes it is used by the inhabitants.

Mr. Loftus having also presented the Museum with excellent specimens both of the plant and insect, I am able to state that the former is *Echinops persicus*, Fisch., and the latter a new species of *Larinus*, to which M. Jekel has applied the name *Larinus mellificus*, and of which he has drawn up the following description:—

“*LARINUS MELLIFICUS*, *Jekel* (fig. 3). Breviter ovatus, convexus, niger, nitidus; infra subtiliter, lateribus thoracis margineque elytrorum intus medio versus angulariter ampliata, apicem occupante griseo-cinerascenti tomentosis; rostro leviter punctato, basi utrinque bicanaliculato cum elevatione media lata subcariniformi; thorace subconico antice tubulato, supra confertim sat rude punctato, lateribus subrugoso; elytris striato-punctatis, interstitiis latis, planis, transversim subtilissime rugulosis, cum abdomine tenuissime alutaceis, punctis majoribus remotioribus impressis; pectore, lateribus, pedibusque rugoso-punctatis, femoribus infra fortiter oblique costato-rugosis; tibiis intus, anticis fortius crenulatis. Long. (rostr. excl.) 16–18, lat. elytr. 8–9 mill.

* Comptes Rendus, 28 Juin 1858, p. 1276.

“Patria—Persia, prope Kirrind, ubi *Echinopsidis* speciem frequentat, ejus plantæ caules ab hoc insecto puncti materiam quamdam saccharinam sudant.” *W. K. Loftus*, Mus. Brit.

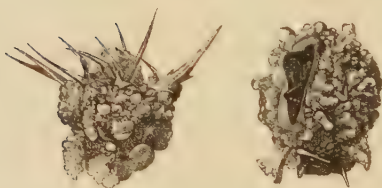
Very similar to *L. Onopordinis*, but proportionably more elongate and less convex; rostrum and thorax longer; pilosity of

Fig. 1.



Larinus maculatus, Faldern.

Fig. 2.



The cocoons of *Larinus maculatus*, called in Turkish *Tréhala*.

Fig. 3.



Larinus mellificus, Jekel.

the body underneath much thinner and shorter; thighs thicker, more clavate, the anterior evidently costate-rugose underneath; without whitish marks on the elytra, and without that layer of light-brown earth-like pollinose transudation which is often wanting in rubbed specimens of *Larinus Onopordinis*. The freshest

specimens have the griseous margin of the elytra, which parts from the base under the shoulder, obliquely and angularly ampliate interiorly towards the middle, where it reaches the second stria. This griseous pilosity fills all the tips of the elytra, leaving bare only the sutures, an angular notch behind the middle (which forms with that apical part of the suture a kind of hook on each elytron), and two round spots, one submarginal fronting the tip of the notch, the other larger, discoidal, behind the foot of the notch, much above the tip.

Catalogue of the Heterocerous Lepidoptera collected at Singapore
by Mr. A. R. WALLACE, with Descriptions of New Species.
By FRANCIS WALKER, Esq., F.L.S.

[Read Feb. 17, 1859.]

Fam. URANIIDÆ, *Westwood*.

Gen. NYCTALEMON, *Dalman*.

1. *Nyctalemon* Hector, *White, Walk. Cat. Lep. Het.* vii. 1771.
Inhabits also Borneo.

Fam. AGARISTIDÆ, *Swainson*.

Gen. EUSEMIA, *Dalman*.

2. *Eusemia maculatrix*, *Westwood, Cat. Orient. Ent.* 67, pl. 33. f. 1.
Inhabits also Hindostan and Java.
3. *Eusemia mollis*, *Walk. Cat. Lep. Het.* vii. 1774.
Inhabits also Hindostan.

Fam. ZYGÆNIDÆ, *Leach*.

Gen. SYNTOMIS, *Illiger*.

4. SYNTOMIS ANNOSA, n. s. *Fæm.* Cinereo-fusca; capite, antennis apice, humeris abdominisque maculis lateralibus albis; alis maculis quatuor vitreis.
Female. Cinereous brown. Head white. Antennæ serrated, white towards the tips. Thorax with a large white spot on each side in front. Abdomen somewhat compressed towards the base, with white spots along each side. Wings long, with the discal areolets from the base to beyond the middle mostly vitreous, but having the veins bordered with brown. Length of the body 9 lines; of the wings 22 lines.
5. SYNTOMIS CHLOROLEUCA, n. s. *Fæm.* Nigro-viridis; fronte, antennis apice, humeris abdominisque fasciis duabus dorsalibus fasci-

isque ventralibus albis; alis purpureo-nigris, anticis maculis quatuor vitreis, posticis macula una vitrea.

Female. Blackish-green. Front, antennæ towards the tips, and two humeral spots white. Antennæ simple. Abdomen with a white band at the base, and with another on the fifth segment, and with white ventral bands. Wings purplish-black; fore wings with four vitreous spots; the fore one of the interior pair not one-third of the size of the hind one, which is very long; the fore one of the exterior pair much narrower than the hind one, and accompanied at its inner end by an elongated vitreous point; hind wings with an elongated vitreous spot. Length of the body $4\frac{1}{2}$ lines; of the wings 12 lines.

6. *SYNTOMIS XANTHOMELA*, n. s. *Mas.* Nigra; fronte, thoracis margine antico abdominisque fasciis ochraceis; antennis apice albis, abdominis fasciculo pallide cinereo; alis anticis maculis quinque vitreis, posticis maculis duabus vitreis.

Male. Black. Front, fore borders of the thorax and hind borders of the abdominal segments ochraceous; dorsal tuft pale cinereous, rather large. Antennæ simple, white towards the tips. Fore wings with five vitreous spots, of which the basal one is small and round, and the other four large and elongated; the exterior pair intersected by the black veins. Hind wings with two vitreous spots, of which one is basal and the other discal. Length of the body 4 lines; of the wings 9 lines.

Fam. LITHOSIIDÆ.

Gen. NYCTEMERA, *Hübner*.

7. *NYCTEMERA MUNDIPICTA*, n. s. *Mas et Fæm.* Fusca; capite thoraceque albo vittatis; abdomine albo guttis dorsalibus fuscis; alis anticis basi albo venosis, fascia exteriori obliqua postice abbreviata alba, posticis albis fusco marginatis. *Fæm.* Thorace fascia postica lutea, abdomine fusco fasciis albis; alis anticis fascia latiore vix abbreviata.

Male. Brown. Head and thorax with white lines. Antennæ moderately pectinated. Pectus with black spots, luteous on each side. Abdomen white, with brown dorsal dots; tip luteous. Legs white. Fore wings with white veins towards the base, and with an exterior oblique white band, which is narrower hindward, and ends at some distance from the interior border. Hind wings white, with a broad brown border. *Female?* Larger. Antennæ slightly pectinated. Thorax with a slight luteous band in front, and another hindward. Abdomen brown, with a white band on the hind border of each segment; under side white, with brown spots along each side. Fore wings with the band much broader, hardly straightened hindward, and ending very near the interior border. Length of the body 5-6 lines; of the wings 16-20 lines.

Gen. CYCLOSIA, *Hübner*.

8. *CYCLOSIA SUBMACULANS*, n. s. *Mas.* Nigra, velutina, squamis nonnullis cyaneis, subtus albo cyaneoque fasciata; alis anticis purpureo-nigris, punctis paucis exterioribus, alis posticis fuscis, punctis submarginalibus albis; alis quatuor subtus fuscis, guttis exterioribus et submarginalibus albis.

Male. Black, with a few metallic blue specks, and with metallic bluish-white pectoral spots and ventral bands. Antennæ slightly pectinated. Wings velvety, rather long, brown beneath, with an exterior and a submarginal row of white dots; fore wings purplish-black, with a few exterior and submarginal white points; hind wings brown, with submarginal white points. Length of the body 9 lines; of the wings 28 lines.

9. *CYCLOSIA NIVIPETENS*, n. s. *Mas.* Cinereo-nigra; antennis cyaneo-nigris subpectinatis; alis anticis fascia lata submarginali alba.

Male. Cinereous-black. Antennæ bluish-black. Fore wings with a broad, submarginal, upright, white band, which is much narrower hindward, and is intersected by the black veins. Length of the body 7 lines; of the wings 22 lines.

Gen. PIDORUS, *Walk.*

10. *PIDORUS CONSTRICTUS*, n. s. *Mas.* Cyaneo-niger, subtus testaceus; antennis pectinatis corpore vix brevioribus; thoracis margine antico coccineo; alis angustis, anticis fascia exteriori subrecta subobliqua flavo-alba, posticis cinereo-nigris.

Male. Bluish-black, testaceous beneath. Antennæ moderately pectinated, hardly shorter than the body. Thorax crimson along the fore border. Wings narrow, somewhat testaceous beneath towards the base; fore wings with a slightly oblique, hardly curved, yellowish-white exterior band; hind wings cinereous-black. Length of the body 5 lines; of the wings 16 lines.

Gen. HYPSEA, *Hübner*.

11. *Hypsa silvandra*, *Cram. Pap. Exot. iv.* 155, pl. 369, f. D (Phalæna). Inhabits also Hindostan, China, and Australia.

12. *Hypsa egens*, *Walk. Cat. Lep. Het.* 11. 453. 12. Inhabits also Hindostan and Java.

Gen. SETINA, *Schrank.*

13. *SETINA BIPUNCTATA*, n. s. *Mas.* Flava; alis anticis punctis duobus basalibus guttaque discali nigris.

Male. Yellow, closely allied to *S. apicalis* (Cat. Lep. Het. 521). Fore wings black along the costa towards the base, where there are two

black points; a small black dot at the tip of the discal areolet. Hind wings a little paler than the fore wings. Length of the body 3 lines; of the wings 8 lines.

Gen. BIZONE, *Walk.*

14. *Bizone hamata*, *Walk. Cat. Lep. Het.* 88. 5493.

Inhabits also China.

Gen. DEIOPEIA, *Stephens.*

15. *DEIOPEIA DETRACTA*, n. s. *Fam.* Pallide lutea; thorace guttis nigris; alis sat angustis nigro guttatis, fimbria pallida nitente; alis anticis nigro transverse quadristrigatis.

Female. Pale luteous. Thorax with six black dots. Wings narrower than in the other species of this genus, with black dots, of which the most part are towards the exterior border, where they form two irregular lines, and are somewhat confluent on the under side; fringe whitish, shining. Fore wings with four short transverse various black streaks, of which the first and the second form an interrupted line. Length of the body 5 lines; of the wings 14 lines.

Gen. DARANTASIA, n. g.

Fam. *Corpus* sat robustum. *Proboscis* distincta. *Palpi* porrecti, breves, caput non superantes; articulus tertius longiconicus, acutus, secundi dimidio non longior. *Antennæ* setacæ, simplices, gracillimæ. *Abdomen* subconicum, alas posticas superans; sexualia sat magna. *Pedes* breves, nudi, sat validi, calcaribus robustis sat longis. *Alæ* breviusculæ, sat angustæ; anticæ apud costam convexæ, apice rotundatæ, margine exteriore perobliquo.

Allied to *Lemyra* (*Cat. Lep. Het.* vii. 1690).

Female. Body rather stout. *Proboscis* moderately long. *Palpi* porrect, short, not extending beyond the head; third joint elongate-conical, acute, about half the length of the second. *Antennæ* setaceous, simple, very slender, full half the length of the body. *Abdomen* nearly conical, extending somewhat beyond the hind wings; anal appendages rather large. Legs short, bare, rather stout; spurs stout, rather long. Wings rather short and narrow; fore wings convex along the costa, rounded at the tips, extremely oblique along the exterior border.

16. *DARANTASIA CUNEIFLENA*, n. s. *Mas.* Nigra; corpore subtus, capite, thoracis fasciis duabus anticis maculaque postica abdominisque fasciis posticis luteis; pedibus luteis, tibiis supra nigris; alis anticis luteo octo-strigatis, posticis luteo strigatis.

Male. Black, mostly luteous beneath. Head luteous. Thorax with two luteous bands in front, and with a luteous spot hindward. Abdomen with luteous bands hindward. Legs luteous; tibiæ black above. Fore wings with eight wedge-shaped luteous streaks, of

which three are near the base, two subcostal, two hindward, and one submarginal and transverse. Hind wings with three luteous streaks, of which the first and second are connected exteriorly, and the third is short, broad, and submarginal. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

Fam. LIPARIDÆ, *Boisduval*.

Gen. ARTAXA, *Walk*.

17. ARTAXA VARIANS, *Walk. Cat. Lep. Het.* iv. 796.

Inhabits also West Africa, Hindostan, and China.

Gen. PANTANA, *Walk*.

18. PANTANA BICOLOR, *Walk. Cat. Lep. Het.* iv. 820.

Note.—*P. dispar*, a native of Hindostan, and *P. ampla*, a native of China, may be varieties of this species.

Fam. NOTODONTIDÆ, *Stephens*.

Gen. DARABITTA, n. g.

Fam. *Corpus* vix robustum. *Proboscis* brevis. *Palpi* longiusculi, oblique ascendentes, non pilosi. *Antennæ* validæ, subcompressæ, breviusculæ, simplices. *Abdomen* conicum, alas posticas non superans. *Pedes* squamosi, læves, breviusculi, sat graciles, calcaribus longis. *Alæ* latiusculæ, non longæ; anticæ apud costam rectæ, apice subrotundatæ, margine exteriore vix convexo.

This genus hardly belongs to the *Notodontidæ*; but its precise situation seems to be uncertain. *Female*. Body hardly stout. *Proboscis* short. *Palpi* rather long and slender, not pilose, obliquely ascending, rising a little higher than the vertex; third joint elongate-conical, less than half the length of the second. *Antennæ* stout, bare, slightly compressed, little longer than the thorax; joints few. *Abdomen* conical, not extending beyond the hind wings. *Legs* squamous, smooth, rather short and slender; spurs long. *Wings* rather broad, not long: fore wings straight along the costa, slightly rounded at the tips; exterior border hardly convex, very slightly oblique.

19. DARABITTA STRIGICOSTA, n. s. *Fam.* *Rufa*, vix cinerascens; alis anticis linea submarginali e punctis nigris, lineolis tribus costalibus obliquis albis, prima angulata, secunda tertiaque connexis.

Female. Red, with a slight cinereous tinge, more cinereous beneath. *Antennæ* pale. Fore wings with three white oblique costal streaks; first streak forming an outward angle; second connected in the disk with the third, which is oblique in the contrary direction; a row of submarginal black points. Length of the body 3 lines; of the wings 8 lines.

Fam. LIMACODIDÆ, *Duponchel*.Gen. MIRESA, *Walk*.

20. *MIRESA CURVIFERA*, n. s. *Mas.* Rufa, crassa, brevis; antennis late pectinatis; alis anticis linea exteriore arcuata nivea, spatio contiguo exteriore obscuriore.

Male. Red, thick, short. Palpi porrect, extending a little beyond the head. Antennæ shorter than the thorax, broadly pectinated except towards the tips. Abdomen short, obtuse, not extending beyond the hind wings. Legs short. Wings not broad. Fore wings straight along the costa, rounded at the tips, darker on the exterior side of a curved transverse bright white line, which is somewhat beyond the middle; exterior border rather oblique. Hind wings a little paler than the fore wings. Length of the body $4\frac{1}{2}$ lines; of the wings 12 lines.

Fam. SATURNIIDÆ, *Walk*.Gen. ATTACUS, *Linn*.

21. *ATTACUS ATLAS*, *Linn. Syst. Nat.* 808.

Inhabits also Hindostan, Ceylon, China, and Borneo.

Fam. BOMBYCIDÆ.

Gen. BOMBYX, *Linn*.

22. *BOMBYX SUBNOTATA*. *Mas.* Ferruginea, crassa; antennis late pectinatis; abdominis apice laminis lateralibus fimbriatis; alis anticis margine exteriore subundulato subexciso, macula subtus costali subapicali flava.

Male. Ferruginous, thick, pilose. Mouth obsolete. Antennæ broadly pectinated. Abdomen much more slender than the thorax, not extending beyond the hind wings; anal lateral appendages fringed. Legs short, stout. Fore wings rounded at the tips, extremely oblique along the exterior border, which is slightly angular in the middle and slightly excavated on each side; under side with a yellow costal spot near the tip. Hind wings with the interior border densely fringed towards the tip. Length of the body 7 lines; of the wings 16 lines.

Fam. LEUCANIDÆ, *Guénée*.Gen. MYTHIMNA, *Hübner*.

23. *MYTHIMNA INDUCENS*, n. s. *Fæm.* Lateritio-rufa, subtus albida; palporum articulo tertio brevissimo; abdomine rufescenti-cano; alarum anticarum puncto discali nigro, lineis duabus nigricantibus subarcuatis indistinctis, alis posticis rufescenti-canis.

Female. Brick-red colour, mostly whitish beneath. Palpi obliquely ascending, not rising to the height of the vertex; third joint extremely small, less than one-sixth of the length of the second. Abdomen reddish-hoary, extending but little beyond the hind wings. Legs stout, squamous; spurs moderately long. Fore wings very slightly convex along the costa, rectangular at the tips; exterior border slightly oblique, nearly straight; two slender, indistinct, slightly curved, blackish lines, having between them a more distinct black discal point. Hind wings reddish-hoary, the reddish tinge most prevalent towards the exterior border. Length of the body 7 lines; of the wings 18 lines.

Fam. GONOPTERIDÆ, *Guénée*.

Gen. ANOMIS, *Hübner*.

24. ANOMIS MUTILATA, n. s. *Mas.* Rufa, robusta, subtus rufescenti-cinerea; palpis longis subascendentibus; abdomine latiusculo; alarum anticarum lineis tribus indistinctis angulosis nigricantibus, orbiculari alba punctiformi, margine exteriore postico perobliquo subexcavato.

Male. Red, stout, reddish cinereous beneath. Palpi long, obliquely ascending; third joint slender, linear, obtuse at the tip, a little shorter than the second. Antennæ stout, with extremely short setæ. Abdomen rather broad, extending a little beyond the hind wings. Fore wings with three blackish, indistinct, slightly diffuse, zigzag lines, which are slightly bordered hindward with pale yellow; orbicular mark white, punctiform; exterior border slightly angular, hardly oblique, and slightly truncated on the fore half, extremely oblique and with two slight excavations on the hind half; fringe partly white. Hind wings not paler than the fore wings. Length of the body 7 lines; of the wings 18 lines.

Gen. THALATTA, *Walk.*

25. *Thalatta aurigutta*, *Walk. Cat. Lep. Het.* xv. 1793.

Fam. HYPOGRAMMIDÆ, *Guénée*.

Gen. BRIARDA, *Walk.*

26. BRIARDA PLAGIFERA, n. s. *Mas.* Ferrugineo-cinerea; capite thoraceque antice nigricantibus; tibiis ciliatis; alis sat angustis subdenticulatis, anticarum fascia basali, macula discali maculaque costali exteriore nigricantibus, lineis exteriore et submarginali fuscis duplicatis denticulatis subnebulosis; alis posticis pallide cinereis, semi-hyalinis, fusco latissime marginatis.

Male. Cinereous, tinged with ferruginous. Head and fore part of the thorax blackish. Palpi obliquely ascending; third joint linear, conical

at the tip, about half the length of the second. Antennæ hardly setose. Abdomen extending a little beyond the hind wings. Legs rather stout; tibiæ fringed; spurs very long. Wings rather narrow, slightly denticulated. Fore wings slightly rounded at the tips, very oblique along the exterior border; a blackish band near the base, abbreviated hindward; a large blackish spot on the reniform mark, and a diffuse blackish spot near the tip of the costa; exterior and submarginal lines brown, double, denticulated, with the space along their borders somewhat clouded. Hind wings pale cinereous, semi-hyaline, with very broad brown borders. Length of the body 9 lines; of the wings 22 lines.

Fam. CATEPHIDÆ, *Guénée*.

Gen. STEIRIA, *Walk.*

27. STEIRIA PHRYGANEOIDES, n. s. *Mas.* Pallide cinerea, rufescente conspersa; palpis longis vix ascendentibus; alis sat angustis denticulatis; alarum anticarum squamis nonnullis nigris fuscisque, marginibus exteriore et interiore non conspersis, reniformi magna; alis posticis pallide cinereis, fusco late marginatis.

Male. Pale cinereous, thickly speckled with ferruginous red. Palpi long, hardly ascending, almost straight; third joint linear, obtuse at the tip, rather shorter than the second. Antennæ bare. Abdomen conical, extending rather beyond the hind wings; apical tuft small. Legs rather long and slender, almost bare; spurs very long. Wings rather narrow; exterior border denticulated. Fore wings with the speckles mostly confluent in the disk, mostly wanting along the interior and exterior borders; several black and brown speckles, some of which border the large reniform mark. Hind wings pale cinereous, with a broad brown border. Length of the body 8 lines; of the wings 20 lines.

Fam. OPHIDERIDÆ, *Guénée*.

Gen. OPHIDERES, *Boisduval*.

28. *Ophideres Salaminia*, *Cram. Pap. Exot.* 71. 117, pl. 174. fig. A. Inhabits also Hindostan, Ceylon, Java, and China.

29. *Ophideres discrepans*, *Walk. Cat. Lep. Het.* xiii. 1227.

30. *Ophideres smaragdipicta*, *Walk. Cat. Lep. Het.* xiii. 1229.

Fam. PHYLLODIDÆ, *Guénée*.

Gen. LYGNIODES, *Guénée*.

31. *Lygniodes endoleuca*, *Guén. Noct.* iii. 124.

Inhabits also Java.

Fam. EREBIDÆ, *Guénée*.Gen. SYPNA, *Guénée*.

32. *Sypna subsignata*, *Walk. Cat. Lep. Het.* xiv. 1261.

Fam. OMMATOPHORIDÆ, *Guénée*.Gen. PATULA, *Guénée*.

33. *Patula macrops*, *Linn. Syst. Nat.* 225 (Noctua).

Inhabits also West and South Africa, Madagascar, Hindostan, and Ceylon.

Gen. ARGIVA, *Hübner*.

34. *Argiva hieroglyphica*, *Drury, Ins. Exot.* 11. 3, pl. 2. f. 1 (Noctua).

Inhabits also Madagascar, Hindostan, and Ceylon.

Fam. OPHIUSIDÆ, *Guénée*.Gen. CÆCILA, *Walk.*

35. *Cæcila complexa*, *Walk. Cat. Lep. Het.* xv. 1825.

Gen. OPHISMA, *Guénée*.

36. *Ophisma Umminia*, *Cram. Pap. Exot.* 111. 137, pl. 267. f. 7 (Noctua).

Inhabits also Java and Sumatra.

Gen. ACHÆA, *Hübner*.

37. *Achæa mercatoria*, *Fabr. Ent. Syst.* 111. 2, 62. 175. (Noctua).

Inhabits also Hindostan and Java.

Fam. THERMESIDÆ, *Guénée*.Gen. THERMESIA, *Hübner*.

38. *THERMESIA? RECUSATA*, n. s. *Mas.* Rufescenti-cinerea, robusta, nigricante conspersa, capite thoraceque antico fuscis; palpis longissimis ascendentibus subarcuatis; antennis subsetosis, alis linea exteriore recta obliqua nigricante extus diffusa, linea interiore tenui subarcuata nigricante, linea submarginali e punctis lineaque marginali nigris.

Male. Reddish cinereous, stout, with blackish speckles. Head and fore part of the thorax brown. Frontal tuft acute. Palpi very long, slightly curved, nearly vertical; third joint linear, acute, shorter than the second. Antennæ slightly setose. Abdomen hardly extending

beyond the hind wings. Wings with the speckles here and there confluent; lines blackish; interior line slender, slightly curved; exterior line straight, oblique, diffuse on the outer side, extending almost to the tips of the fore wings; submarginal line represented by points; marginal line slightly undulating. Fore wings rectangular at the tips; exterior border slightly bent; its fore part not oblique; orbicular and reniform marks indistinct. Length of the body 6 lines; of the wings 16 lines.

Gen. *HYPERNARIA*, Guénée.

39. *HYPERNARIA DIFFUNDENS*, n. s. *Fam.* Cinerea, robusta, fusco conspersa; palporum articulo secundo extus fusco, tertio aciculari longissimo, alarum lineis interiore et exteriori vagis dentatis lineaque media recta sat obliqua squamis fuscis, punctis marginalibus atris, alis anticis acutis, orbiculari punctiformi atra, litura reniformi angusta fusco marginata extus excavata.

Female. Cinereous, stout, speckled with brown. Palpi very slightly curved; second joint brown on the outer side; third acicular, a little shorter than the second. Antennæ minutely setose. Abdomen not extending beyond the hind wings. Wings with the interior and exterior lines angulose, diffuse, composed of brown speckles; middle line more oblique, straight, slender, double, obsolete towards the costa of the fore wings, bordered with diffuse angular streaks of brown speckles; marginal points deep black. Fore wings acute; orbicular mark black, punctiform; reniform narrow, brown, bordered, excavated on the outer side; exterior border slightly convex. Length of the body 10 lines; of the wings 22 lines.

Gen. *UGIA*, Walk.

40. *Ugia disjungens*, Walk. *Cat. Lep. Het.* xv. 1860.

Fam. PLATYDIDÆ, Guénée.

Gen. *MASCA*, Walk.

41. *Masca abactalis*, Walk. *Cat. Lep. Het.* xvi. 9.

Fam. HYPENIDÆ, Herr.-Schæffer.

Gen. *HYPENA*, Schrank.

42. *Hypena ruralis*, Walk. *Cat. Lep. Het.* xvi. 65.
Inhabits also Ceylon.

Gen. *MACNA*, Walk.

43. *Macna pomalis*, Walk. *Cat. Lep. Het.* xvi. 78.

Fam. MARGARODIDÆ, Guénée.

Gen. MARGARODES, Guénée.

44. *Margarodes Amphitritalis*, Guén. *Delt. et Pyral.* 307, 327.
Inhabits also Hindostan.

Gen. NEURINA, Guénée.

45. *Neurina Procopialis*, *Cram. Pap. Exot.* iv. 152, pl. 368. f. E. (*Phælæna Pyralis Procopia*.)
Inhabits also Hindostan and Java.

Fam. ENNOMIDÆ, Guénée.

Gen. BULONGA, n. g.

Corpus gracile. *Proboscis* brevissima. *Palpi* breves, porrecti, angulati. *Antennæ* simplices. *Abdomen* conicum. *Pedes* graciles, nudi, calcaribus non longis, tibiis anticis brevissimis. *Alæ* sat latæ; anticæ acutæ, margine exteriore sat obliquo; posticæ abdomen superantes.

Body slender. *Proboscis* very short. *Palpi* as long as the breadth of the head; second joint obliquely ascending; third porrect, rather shorter than the second, with which it forms an obtuse angle. *Antennæ* simply filiform. *Abdomen* conical. *Legs* slender, bare; spurs rather short; fore tibiæ very short. *Wings* rather broad; fore wings rectangular at the tips; costa hardly convex; exterior border rather oblique. *Hind wings* with the interior angle prominent, acute.

46. *BULONGA SCHISTACEARIA*, n. s. *Fœm.* Glauco-cinerea, alis nitentibus, linea marginali nigra fimbria interlineata, anticis fusco quadrilineatis, posticis trilineatis.

Female. Glauco-cinereous, paler beneath. Head and palpi reddish. *Wings* shining; marginal line black; fringe pale cinereous, including a darker line. Fore wings with four straight oblique brown lines; second line broader than the first, apparent also on the hind wings; third narrower and darker than the others, blackish, and still more distinct on the hind wings, where it is bordered with whitish on the outer side; fourth more indistinct than the others, still more indistinct on the hind wings. Length of the body 6 lines; of the wings 16 lines.

Fam. AMPHIDASYDÆ, Guénée.

Gen. DARISTANE, n. g.

Mas. *Corpus* robustum. *Proboscis* brevissima. *Palpi* validi, breves, obtusi, oblique ascendentes; articulus tertius minimus. *Antennæ* setacæ, simplices. *Abdomen* conicum, alas posticas non superans.

Pedes validi, breviusculi; tibiæ anticæ brevissimæ, posteriores latissimæ, calcaribus longis. *Alæ* breviusculæ, sat latæ; anticæ acutæ.

Male. Body robust. Proboscis very short. Palpi short, stout, obtuse, obliquely ascending; third joint very small. Antennæ setaceous, simple. Abdomen conical, not extending beyond the hind wings. Legs stout, rather short; tibiæ pilose; fore tibiæ very short; posterior tibiæ very broad, especially the middle pair. Wings rather short, moderately broad. Fore wings straight along the costa, acutely rectangular at the tips; exterior border rather oblique.

47. *DARISTANE TIBIARIA*, n. s. *Mas.* Cinerea, nitens, alis nigro conspersis, fascia media rufescente non bene determinata, anticis costa albida nigro punctata.

Male. Cinereous, shining, a little paler beneath. Wings speckled with black; an indistinct oblique reddish middle band; costa of the fore wings whitish, with black points. Length of the body 5 lines; of the wings 12 lines.

Fam. PALYADÆ, Guénée.

Gen. EUMELEA, Duncan.

48. *Eumelea Rosaliata*, *Cram. Pap. Exot.* iv. 152, pl. 368. f. F. (*Phaëna Geometra Rosalia*.)

Inhabits also Amboyne.

Fam. EPHYRIDÆ, Guénée.

Gen. EPHYRA, Duponchel.

49. *EPHYRA QUADRISTRIARIA*, n. s. *Fæm.* Rufescens, subtus flava, alis flavis rufescente conspersis, fascia exteriore perobliqua rufescente, anticis acutis, lituris duabus costalibus obliquis fuscis.

Female. Reddish, yellow beneath. Proboscis short. Palpi short, slightly ascending; third joint linear, obtuse, a little shorter than the second. Antennæ short, stout, setaceous. Abdomen not extending beyond the hind wings. Legs bare, rather long and slender; spurs long. Wings yellow, with reddish speckles, and with a straight reddish band, which extends from beyond the middle of the interior border of the hind wings to the tips of the fore wings. Fore wings acute, with two oblique brown costal marks; exterior border rather oblique. Length of the body 4 lines; of the wings 12 lines.

Gen. ANISODES, Guénée.

50. *ANISODES EXPUNCTARIA*, n. s. *Fæm.* Luteo-cervina, palpis longis angulatis, antennis breviusculis, alis ferrugineo subconsersis. linea media fusca undulata valde indistincta, lineis interiore et exteriore e punctis nigris, punctis marginalibus nigris.

Female. Pale luteous fawn colour. Proboscis short. Palpi long, slightly decumbent; third joint a little shorter than the second, with which it forms an obtuse angle. Antennæ simple, short. Wings minutely and indistinctly sprinkled with ferruginous; a brown, diffuse, undulating, very indistinct middle line, which is obsolete in the hind wings; interior and exterior lines indicated by widely separated black points; marginal points black. Fore wings rectangular at the tips; exterior border slightly oblique. Length of the body 6 lines; of the wings 8 lines.

Fam. ACIDALIDÆ, *Guénée.*

Gen. SYNEGIA, *Guénée.*

51. *Synegia botydaria*, *Guén. Uran. et Phal.* i. 423. 694.
Inhabits also Borneo.

Gen. DRAPETODES, *Guénée.*

52. *Drapetodes mitaria*, *Guén. Uran. et Phal.* i. 424. 695.
Inhabits also Hindostan.

Gen. TIMANDRA, *Duponchel.*

53. *TIMANDRA AJAIA*, n. s. *Mas.* Glaucescenti-cinerea; antennis setosis, alis linea perobliqua fusca antice abbreviata, linea marginali nigra, anticis valde acutis, reniformi tenui fusca.

Male. Cinereous, with a glaucous tinge. Proboscis short. Palpi very short, obliquely ascending; third joint extremely small. Antennæ setose, somewhat shorter than the body. Wings with a straight, very oblique, brown line, which extends from the middle of the interior border of the hind wings towards the tip of the fore wings, on approaching which it is obsolete; marginal line black. Fore wings very acute; exterior border extremely oblique; reniform mark brown, very slender. Hind wings extending beyond the abdomen. Length of the body 6 lines; of the wings 17 lines.

Gen. ZANCLOPTERYX, *Herr.-Schæffer.*

54. *Zanclopteryx saponaria*, *Herr.-Schæffer, Guén. Uran. et Phal.* 11. 16, 915.
Inhabits also Ceylon.

Fam. MICRONIDÆ, *Guénée.*

Gen. MICRONIA, *Guénée.*

55. *Micronia rectinervata*, *Guén. Uran. et Phal.* 11. 27, 933.

Fam. ZERENIDÆ.

Gen. STALAGMIA, *Guénée*.

56. *Stalagmia guttaria*, *Guér. Icon. Regn. Anim. Ins.* pl. 90 (*Phalæna*).

Catalogue of the Heterocerous Lepidopterous Insects collected at Malacca by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER.

Fam. SPHINGIDÆ, *Leach*.Gen. MACROGLOSSA, *Ochsenheimer*.

1. *Macroglossa Passalus*, *Drury, Exot. Ins.* ii. 52, pl. 29. f. 2 (*Sphinx*).
Inhabits also Hindostan and Java.
2. *Macroglossa corythus*, *Boisd. MSS.*; *Walk. Cat. Lep. Het.* viii. 92. 14.
Inhabits also Hindostan, Ceylon, and Java.

Fam. AGARISTIDÆ, *Swainson*.Gen. EUSEMIA, *Dalman*.

3. *Eusemia maculatrix*, *Westw.* (See Singapore Sp. No. 2.)
4. *Eusemia mollis*, *Walk.* (See Singapore Sp. No. 3.)
5. EUSEMIA SUBDIVES, n. s. *Mas.* Atræ, antennis subpectinatis, abdomine fasciis luteis, alis anticis fascia exteriore recta non obliqua testacea; posticis ochraceis atro marginatis.
Male. Deep black. Antennæ slightly pectinated, slightly hooked at the tips. Abdomen with a luteous band on the hind border of each segment. Fore wings with an upright, straight, testaceous exterior band, which does not extend to the interior border. Hind wings bright ochraceous, with a deep black border, which is irregular on the inner side and is joined in front to a black spot, the latter, on the under side, containing a white curved line. Length of the body 9 lines; of the wings 28 lines.

Fam. LITHOSIIDÆ, *Stephens*.Gen. NYCTEMERA, *Hübner*.

6. *Nyctemera tripunctaria*, *Linn. Syst. Nat.* 864. 226 (*Geometra*).
Inhabits also Hindostan and China.

Gen. EUSCHEMA, *Hübner*.

7. *Euschema subrepleta*, *Walk. Cat. Lep. Het.* xi. 406. 3.
Inhabits also Ceylon and Borneo.

Fam. LIPARIDÆ, *Boisduval*.

Gen. PANTANA.

8. *Pantana bicolor*, *Walk.* (See Singapore Sp. No. 17.)

Fam. ORTHOSIDÆ, *Guénée*.Gen. CAREA, *Walk.*

9. *Carea varipes*, *Walk. Cat. Lep. Het. x.* 475.

Fam. HYBLÆIDÆ, *Guénée*.Gen. HYBLÆA, *Fabr.*

10. *Hyblæa tortricoides*, *Guén. Noct. ii.* 391.

Inhabits also Borneo.

11. *Hyblæa erycinoides*, *Walk. Cat. Lep. Het. xv.* 1792.

Fam. PHYLLODIDÆ, *Guénée*.Gen. LYGNIODES, *Guénée*.

12. *Lygniodes endoleuca*, *Guén.* (See Singapore Sp. No. 30.)

Fam. OPHIUSIDÆ, *Guénée*.Gen. OPHIUSA, *Ochsenheimer*.

13. *Ophiusa fulvotænia*, *Guén. Noct. iii.* 272. 1710.

Inhabits also Hindostan, Ceylon, Java, and Sumatra.

Fam. THERMESIDÆ, *Guénée*.Gen. COTUZA, *Walk.*

14. *COTUZA CONFIRMATA*, n. s. *Mas.* Cinereo-ferruginea, robusta, dense vestita, subtus alba; palpis latis compressis oblique ascendentibus; articulo tertio minimo, antennis plus dimidio basali subpectinatis, alis linea media recta perobliqua nigro-fusca antice angulosa et retracta, linea exterior e denticulis nigrofuscis albido terminatis, fimbria apice alba, alis anticis subhamatis, linea interior nigrofusca undulata orbiculari nigra punctiformi, reniformi et litura costali albis nigro marginatis.

Male. Cinereous-ferruginous, stout, densely pilose, white beneath. Palpi broad, compressed, obliquely ascending, not rising higher than the head; third joint obtuse, extremely short. Antennæ slightly pectinated to nearly two-thirds of the length, bare from thence to the tips. Abdomen not extending beyond the hind wings. Legs white;

tibiæ ferruginous above. Wings ample; a blackish brown, straight, very oblique line, which is zigzag, and retracted towards the costa of the fore wings; exterior line composed of blackish-brown, very acute, whitish-pointed angles; fringe white exteriorly. Fore wings slightly hooked, with an interior undulating blackish-brown line; orbicular mark black, punctiform; reniform white, black-bordered, forming a triangular spot and an anterior point; a small exterior white costa, with mark. Length of the body 11 lines; of the wings 28 lines.

Fam. ACIDALIDÆ, *Guénée*.

Gen. ZANCLOPTERYX, *Herr.-Schæff.*

15. *Zanclopteryx saponaria*, *Herr.-Schæff.* (See Singapore Species, No. 54.)

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THE END

JOURNAL
OF
THE PROCEEDINGS
OF
THE LINNEAN SOCIETY.

ZOOLOGY.

VOL. IV.

LONDON:
LONGMAN, GREEN, LONGMANS AND ROBERTS,
AND
WILLIAMS AND NORGATE.
1860.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

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JOURNAL OF THE PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

On the dermal armour of *Jacare* and *Caiman*, with notes on the Specific and Generic Characters of recent *Crocodylia*. By T. H. HUXLEY, Esq., F.R.S., F.L.S., Prof. of Nat. History, Gov. School of Mines.

[Read Feb. 17th, 1859.]

IN the course of a recent investigation into the nature of the singular extinct reptile, *Stagonolepis*, I was led to inquire somewhat minutely into the character of the exoskeleton, or dermal armour, of the existing *Crocodylia*. To my surprise, I found that very little detailed information on this subject was to be obtained from the standard repertories of Comparative Anatomy, or even from the special monographs on Crocodilian structure and classification; but I was still more astonished to discover, among whole genera of recent *Crocodylia*, an exoskeleton possessed of characters such as have been universally supposed to be peculiar to long extinct forms of the order, and whose existence in any recent species has hitherto, so far as I can ascertain, been completely overlooked.

The attempt to discover the limits within which this remarkable exoskeleton is to be found, led me to look, more critically than I had previously done, into the arrangement and specific characterization of the recent *Crocodylia*. I have thereby arrived at results which, imperfect as they are, may be of service by leading others to inquire into the exact characters of species not at present within my

reach; and I therefore propose to preface my account of the peculiarities of the exoskeleton in two of the genera of recent Crocodiles with some remarks on the classification of the group, and with a few notes upon the characters of the species and the limits of the genera.

Everyone is acquainted with the great improvement effected in this branch of Herpetology by Cuvier, who divided the Crocodiles, which he regarded as constituting only a single genus, into the three subgenera *Alligatores*, *Crocodili*, and *Longirostres*. Subsequent writers have admitted these highly natural subdivisions; but there has been a constant tendency to raise their rank. The genus *Crocodilus* has become the order *Crocodilia*; the subgenera *Alligatores*, &c., have been elevated into families; Dr. Gray has shown that the *Alligatores* must be divided into three genera, and that there are at least two genera of *Crocodili*; and, while one of Cuvier's species of *Longirostres* has been suppressed, the group is very generally retained with a changed name (*Gavialis*), a very important addition having been made to it in the *Crocodilus Schlegelii* of Müller and Schlegel.

Unless the considerable materials contained in the British Museum, the Hunterian collection, the collection of Dr. Grant, and the Christchurch Museum at Oxford had been freely placed at my disposal, I should have been wholly unable to acquire the information contained in the following pages. It is only right, therefore, that I should take this opportunity of offering my thanks to my friends Dr. Gray, Prof. Quekett, Dr. Grant, and Dr. Rolleston for the many facilities they have liberally afforded me.

The recent species of the order *Crocodilia* are divisible into three families, which correspond with the original subgenera of Cuvier, and may be termed the *Alligatoridæ*, the *Crocodilidæ*, and the *Gavialidæ*.

I. In the ALLIGATORIDÆ the teeth are strong and unequal, and the posterior ones differ greatly in shape from the anterior. The anterior pair of mandibular teeth, and the fourth pair (or the so-called canines) are received into pits in the margins of the premaxilla and maxilla; while the mandibular teeth behind these pass inside, and not between, the maxillary teeth. The mandibular symphysis does not extend back beyond the level of the fifth tooth, and often not nearly so far. The line of the premaxillo-maxillary suture on the palate is straight, or convex forwards. The wide posterior nares look downwards, and are situated forwards on the palate.

This family embraces three genera, readily distinguishable by osteological characters—*Alligator*, *Caiman*, and *Jacare*.

Genus 1. ALLIGATOR.

Dental formula, $\frac{20-20}{20-20}$. 9th maxillary tooth the largest of its series. The snout is very broad, flattened, and rounded at the end. There is an indistinct longitudinal interorbital ridge; and there are two short ridges along the line of junction of the prefrontal and lachrymal bones. The aperture of the external nares is divided into two parts, by the prolongation forwards of the nasal bones. The supra-temporal fossæ are well-marked and open, though not large. The vomers do not appear in the palate. The feet are well webbed. The dorsal bony scutes are not articulated together; and there are no ventral scutes.

This genus contains only one species, the well-known *Alligator Mississipiensis*, or *lucius*, which is exclusively North American.

Cuvier (Oss. Foss. ed. 4. vol. ix. p. 211) gives the appearance of the vomer in the palate as a general character of the *Alligatores*; but this bone is not visible in the palate of any of those *Alligatores* which Cuvier would have referred to his *A. lucius* or *A. palpebrosus*, and which form the genera *Alligator* and *Caiman* as here defined. The vomers are in fact as slender and delicate as in the Crocodile, and extend only between the level of the tenth maxillary tooth anteriorly and the descending processes of the prefrontal posteriorly.

What may be called the median nares, or the arch formed by the postero-lateral part of the vomer and the anterior and superior lamina of the palatine bone on each side (which would constitute the posterior boundary of the posterior nares, if the palatine and pterygoid bones gave off no inferior or palatine processes), are situated nearly on a level with the twelfth tooth, or with the palato-maxillary suture.

Genus 2. CAIMAN.

Dental formula $\frac{20-20}{22-22}$ (Natterer). The face is without median or transverse ridges, but it is sharply angulated along a line which extends from the orbit forwards along the sides of the snout. The anterior nasal aperture is undivided in the dry skull. The vomers do not appear in the palate. The supra-temporal fossæ are obliterated, the circumjacent bones uniting over them. The webs of the feet are rudimentary. The dorsal scutes are articulated together by lateral sutures and anterior and posterior facets; and there is a ventral shield, consisting of similarly articulated scutes.

Natterer* has described three species of *Caiman*—*C. palpebrosus*, *C. trigonatus*, and *C. gibbiceps*. The Caimans abound chiefly in tropical South America; but they are found as far north as Mexico, a specimen of *C. palpebrosus* in Dr. Grant's collection coming from that country.

Genus 3. JACARE.

The snout is broad, and rounded at the end†. Each prefrontal bone is traversed close to its anterior extremity by the ends of a strong transverse ridge, which then curve round and pass forwards on the lachrymal and maxillary bones, to subside opposite the ninth tooth. The anterior nasal aperture is not divided by bone. The vomers, separated by a longitudinal suture, appear in the palate between the premaxillaries and the palatine plates of the maxillaries. The temporal fossæ, though not large, are open. The webs of the feet are small. The dorsal scutes are articulated together, as in the preceding genus; and there are similarly-articulated ventral scutes. There are 18–20 teeth on each side, above and below; and the fourth tooth in the upper jaw is the largest. The mandibular symphysis extends back nearly to the fifth tooth.

In a skull of *Jacare (fissipes?)*, 19 inches long, in the British Museum, I find that part of the vomer which is visible in the palate to be a rhomboidal plate, somewhat truncated anteriorly, and rather more than $1\frac{1}{2}$ inch long and 1 inch wide. Its anterior end comes within $\frac{3}{8}$ ths of an inch of the posterior margin of the anterior palatal foramen. Its posterior margin reaches to the level of the eighth tooth. The visible portion of each vomer is only its anterior end, which forms a thick and solid wedge-shaped plate, broader in front than behind, and articulating by a rough anterior and outer face with the premaxilla, by an obliquely ridged posterior and outer face with the maxilla, and by its internal face with its fellow. Its upper, rounded surface projects but little into the nasal passage. $2\frac{1}{4}$ inches behind its anterior end, the posterior and upper extremity of the vomer passes into a thin and narrow plate of bone, whose plane is at first inclined at an angle of 45° to that of the anterior part of the bone, but gradually becomes vertical; as it does so it deepens, until, 3 inches behind

* "Beitrag zur näheren Kenntniss der Sudamerikanischen Alligatoren," 'Annalen des Wiener Mus.,' Band i.

† According to Natterer, the dental formula of *J. nigra* and *J. fissipes* is $\frac{19-18}{18-18}$, of *J. sclerops* $\frac{19-19}{20-20}$, of *J. vallifrons* and *J. punctulata* $\frac{20-20}{18-18}$.

the anterior extremity, the vomer is a thin vertical plate of bone, $\frac{5}{8}$ ths of an inch deep, which articulates below with the palatine plate of the maxilla, and, about 1 inch behind this, with the palatine plate of the palatine bone. The upper edge of this plate nowhere extends to one-third of the height of the nasal chamber. It gives off a horizontal process outwards, which, gradually increasing in width, inclines downwards until it comes into contact, first, with the inner surface of the maxilla, and, $\frac{3}{4}$ ths of an inch behind this, with the nasal plate of the palatine bone. In front of its junction with the maxilla, the horizontal plate of the vomer presents a long free edge, concave externally; and this bounds the median nares internally and posteriorly. Throughout its junction with the maxilla, the horizontal plate is parallel-sided; but after it joins the palatine bone, it gradually narrows posteriorly, in consequence of the gradual increase in width of the palatine, and ends almost in a point, $6\frac{1}{4}$ inches behind its anterior end. The posterior edge of the vertical plate is extremely thin, and $\frac{7}{8}$ ths of an inch deep. It articulates with the anterior end of the vertical plate of the pterygoid, while the straight inferior edge articulates throughout with the palatine plate of the palatine bone. The vomers terminate midway between the median nares and the descending process of the prefrontal. The median nares are bounded entirely by the vomer and the maxilla. They correspond with the nasal face of the palato-maxillary suture, but are rather behind its palatine face, and they are about on a level with the interval between the tenth and eleventh teeth. If the anterior edge of the palatine bone bounded them, they would be a little behind the twelfth tooth. The posterior nares, $2\frac{1}{8}$ inches wide, by $\frac{7}{8}$ ths of an inch long, look altogether downwards, are completely divided by a bony septum, and have the form of a rhomboid with its narrowest side posterior. They are surrounded by a strong raised ridge, incomplete only at the anterior and outer angles of the rhomboid.

Five species of *Jacare* are enumerated by Natterer—*J. fissipes*, *J. sclerops*, *J. nigra*, *J. punctulata*, and *J. vallifrons*. They have met with only in South America.

II. In the family of the CROCODYLIDÆ the teeth are usually strong and very unequal in size, and there is always a considerable difference between the anterior and the posterior teeth. The two anterior mandibular teeth are received into pits in the premaxilla; but the canines pass into grooves (which may be converted into fossæ) situated at the junction of the premaxilla and maxilla.

The other mandibular teeth are received between the maxillary teeth. The symphysis of the lower jaw does not extend beyond the level of the seventh or the eighth mandibular tooth. The premaxillo-maxillary suture may be either straight or strongly convex backwards. The divided vomers do not appear in the palate. The posterior nares look more or less backwards, and are transversely elongated. The supra-temporal fossæ are always open, and the feet are distinctly webbed. The dorsal scutes are not articulated; and there are no ventral scutes.

Two genera, *Crocodylus* and *Mecistops*, are distinguishable in this family.

Genus 4. CROCODYLUS.

The teeth are always strong and very unequal, the strongest in the upper jaw being the tenth. The mandibular symphysis does not extend beyond the level of the sixth tooth. There are usually six cervical scutes, in two rows, or forming a rhomb, and separated by a distinct interval from the tergal scutes. There are 18 or 19 teeth above, and 15 below, on each side.

1. *Crocodylus vulgaris*.

As Cuvier has remarked, it is extremely difficult to find good distinctive characters for all the species of this genus. My first difficulty was to ascertain the precise characters of that species which has been misnamed *vulgaris*, inasmuch as I could find neither in the British Museum, nor in the Museum of the Royal College of Surgeons, any *authentic* skeleton or skull of this, the so-called Nilotic Crocodile. This difficulty subsisted up to the time that the chief statements contained in the present essay were laid before the Linnean Society; but since then I have been enabled, by Dr. Gray's permission, to examine the skull of a small stuffed specimen, brought to this country from Egypt by Sir Gardner Wilkinson, and to study the splendid entire skeleton of a *Crocodylus vulgaris* in the Christchurch Museum at Oxford, presented to that Institution by the gentlemen who shot it on the Nile, and set up with great care under the auspices of my friend Dr. Rolleston, Lee's Reader in Anatomy and Curator of the Museum. Fortunately the entire skin has been preserved; so that this is the most complete record of the hard parts of any individual crocodile with which I am acquainted, besides being, so far as I am aware, the only authentic entire skeleton of *Crocodylus vulgaris* in this

country. I subjoin the chief points of interest which I noted in my brief examination of this valuable specimen :—

| | Inches. |
|--|-----------------|
| The total length of the skeleton is | 114 |
| " " " skull | 16 |
| Between the outer edges of the posterior ends of the quadrate bones | $8\frac{3}{4}$ |
| From the snout to the middle of the canine notch... | $2\frac{3}{4}$ |
| Transverse diameter of snout opposite 10th tooth... | $4\frac{7}{8}$ |
| Long axis of orbit..... | $2\frac{1}{4}$ |
| Short axis of orbit..... | $1\frac{5}{8}$ |
| Interorbital space opposite the middle of the orbit | $1\frac{3}{4}$ |
| Anterior edge of the orbit from end of snout | $10\frac{1}{2}$ |
| Sincipital* area in length, about | $2\frac{1}{2}$ |
| " " in breadth anteriorly | $3\frac{3}{4}$ |
| " " " posteriorly | 4 |
| Supra-temporal fossæ, wide | $\frac{7}{8}$ |
| " " long | $1\frac{1}{8}$ |
| Least width of parietal | $\frac{7}{16}$ |
| Total length of mandible | $20\frac{1}{2}$ |
| Its greatest depth..... | 3 |
| Length of cervical region (or anterior 8 vertebræ)... | $10\frac{1}{2}$ |
| " dorso-lumbar region | 27 |
| " sacral " | $3\frac{3}{4}$ |
| Length of humerus | $7\frac{1}{2}$ |
| " ulna | $5\frac{1}{4}$ |
| " fore foot, extreme length | 6 |
| " femur | $8\frac{1}{2}$ |
| " tibia | 6 |
| " hind foot, extreme length | $9\frac{1}{4}$ |

From the above measurements it will be seen that the skull is somewhat slender. Behind the canine groove it widens to the tenth tooth, which is $5\frac{3}{4}$ inches behind the end of the snout. It retains about the same diameter to the twelfth tooth, and then slowly widens again,—a sudden increase in size, to the extent of half-an-inch, taking place opposite the posterior margin of the orbit, owing to the flanging-out of the jugal. On the whole, however, there is a slow and even increase in breadth, from the

* By this term I denote that squarish flat area bounded by the postfrontal and squamosal bones laterally, by the occiput posteriorly, and by a line joining the outer angles of the postfrontals anteriorly.

canine groove to the ends of the ossa quadrata. The nasal aperture is pyriform, its wider end being forwards, and its narrow posterior extremity, into which the pointed ends of the nasal bones project, attaining the level of the first tooth behind the canine groove.

On the left side there is only a pit for the reception of the anterior mandibular tooth, while on the right side this pit is converted into a complete foramen. On the upper face of the skull, the premaxillo-maxillary suture runs vertically upwards through the canine groove, and then passes obliquely backwards to a point 5 inches behind the end of the snout. The anterior part of this suture lies in a strong ridge, which is continued downwards and forwards on the premaxilla to the level of the fifth tooth, a groove separating it from the margin of the nasal aperture. Posteriorly this ridge dies away, but a curved irregular elevation, convex inwards, arises opposite the tenth tooth. It is wholly confined to the maxilla, not extending on to the nasals.

There is a distinct, rough, irregular elevation, bounded on its outer side by a sharp groove, which extends back to the orbit, on the lachrymal bone. The profile of the skull is convex as far as the posterior boundary of the nostril, and very slightly concave from that point as far as the twelfth tooth. It then passes back as a straight, slightly ascending line, only interrupted by the lachrymal ridge, to the margin of the occiput. The inferior margin of the maxilla is convex downwards as far as the canine groove, whose lower end is indicated by a deep sinuation. It then becomes convex again, the crown of the curve being at the ninth and tenth teeth, and its posterior end sweeping into a concavity whose summit is at the twelfth tooth. Behind this the edge of the maxilla is only slightly convex. The inferior contour of the jugal bone is very concave; but the articular end of the quadrate bone descends to the level of the edge of the ninth alveolus.

The orbits have a sort of heart-shape, their apices being turned forwards, and their more convex sides inwards.

The supra-temporal fossæ are half-moon-shaped, their straight sides being external and so inclined that, if prolonged, they would decussate upon a line joining the anterior margins of the orbits.

On the palatine surface of the skull, the premaxillo-maxillary suture runs backwards from the canine groove, as far as the level of the middle of the second alveolus behind the groove (or that of the seventh tooth), which point it reaches at about the junction of the middle with the inner third of the palatine plate of the

maxilla. The suture then turns abruptly forwards until it reaches the level of the anterior margin of the alveolus of the sixth tooth, when it bends suddenly inwards to meet its fellow. The whole suture, therefore, has the form of a W. The vomers are completely hidden.

The posterior nares look downwards and backwards; their aperture is, from the incompleteness of the septum, single, and has a transversely elongated crescentic form. It measures $1\frac{1}{8}$ inch in width by $\frac{3}{8}$ ths antero-posteriorly. The basi-sphenoid is seen for about $\frac{1}{8}$ th of an inch on the base of the skull behind it, bounding the sides of the eustachian tube. The dental formula is $\frac{18-18}{15-15}$. The fourth and tenth teeth are largest in the upper jaw, the first and fourth in the lower. The eight posterior teeth on each side in the upper jaw, and the five posterior in the lower, have a marked constriction between the short crown and the fang of the tooth. There are deep interdental pits for the reception of the mandibular teeth between the third and fourth, and fourth and fifth teeth above, and between the succeeding teeth from the sixth to the thirteenth.

The hyoidean cornua are very strong curved bones, the chord of whose arc measures $3\frac{1}{2}$ inches. They are concave inwards, convex outwards, concave posteriorly, convex anteriorly; they are flattened from side to side below, but they end above in subcylindrical styloid extremities.

In the ninth vertebra the neurocentral suture passes just above the base of the parapophysis; it traverses the parapophysis in the tenth and eleventh vertebræ, while in the twelfth the parapophysis suddenly rises to the root of the diapophysis, and the suture lies far below it. The centra of the dorsal vertebræ, as far as the thirteenth inclusive, have hypapophyses. The diapophyses of the ninth vertebra pass almost horizontally outwards, but are a good deal inclined backwards. In the succeeding vertebræ up to the fourteenth or fifteenth, the diapophyses are, in addition, inclined upwards, the upward inclination being most marked in the tenth, eleventh and twelfth vertebræ. From the fifteenth vertebra onwards, the transverse processes pass almost directly outwards, without either upward or backward inclination. The span of the transverse processes is greatest in the eighteenth and nineteenth vertebræ, in which the distance between the extremities of these processes is $7\frac{1}{4}$ inches, a length about equal to that of the longest vertebral rib.

The rib of the ninth vertebra is terminated by a single long and slender semicartilaginous process which does not unite with the

sternum. Each of the vertebral ribs from the tenth to the seventeenth vertebræ inclusively, on the other hand, is united with the sternum, or its continuation, by two such semicartilaginous costal elements, which may be respectively termed sternal and lateral. The sternal elements of the ribs of the tenth and eleventh vertebræ are united with the sternum proper; those of the next five vertebræ are connected with its median backward prolongation, while those of the seventeenth vertebra are attached to the processes into which this prolongation divides posteriorly.

The sternal costal elements are very broad and flat, and though the lateral ones are less so, they are wide and expanded. The lateral costal pieces of the eleventh to the sixteenth vertebræ inclusively, give attachment to very large and flat, triangular, *processus uncinati*. Those of the twelfth are $3\frac{3}{4}$ inches long and $1\frac{3}{8}$ inch wide at their widest part. The transverse processes of the twentieth vertebra bear rudimentary ribs. The centrum of the thirteenth vertebra is $1\frac{3}{4}$ inch long, and the vertebra is $3\frac{3}{4}$ inches high from the lower edge of the centrum to the summit of the neural spine. The centra of the vertebræ retain nearly the same length to the twentieth caudal; but behind this vertebra they are shorter, as are the anterior dorsal vertebræ. The first caudal vertebra is provided with two styliform bones, which represent the chevron bones of the other caudal vertebræ, but are not united below.

The dorsal scutes have the arrangement which has often been described. They are separated (except perhaps the median rows) by integumentary spaces, neither overlapping nor uniting by sutures; and there are no ventral scutes.

Among the osteological characters which have been detailed, the peculiarities of the tergal armour, the proportions of the skull, combined with the characters of the ridges upon its surface, and the form of the premaxillo-maxillary suture amply suffice to diagnose this species. Even in the small skull, only $5\frac{1}{2}$ inches long, lent to me by Dr. Gray, the characteristic features of the species are well exhibited, although age appears to give rise to many differences. Thus the posterior margin of the external nostrils does not extend so far back as in the adult, and the facial is smaller in proportion to the syncipital region, whose anterior and posterior transverse dimensions are very nearly equal. The orbits are proportionally larger, the interorbital space more excavated; and the outer straight margins of the supratemporal fossæ are parallel with the longitudinal axis of the skull. Still more important differences

are visible on the palatine face of the skull. The premaxillo-maxillary suture reaches back, indeed, to the line of the seventh tooth; but it forms an even curve whose summit is in the middle line. The aperture of the posterior nares, again, has a totally different form from that which it assumes in the adult. It is somewhat heart-shaped, with its apex forwards, measures $\frac{1}{4}$ inch long by $\frac{3}{16}$ ths at broadest, and looks altogether downwards, while its anterior margin is situated far more forward in the palate than that of the adult.

2. *Crocodilus biporcatus*.

This, the best-known Crocodile, is a very well-marked species, characterized (beside the peculiarities of its dermal armour) by a comparatively slender skull, similar in shape to that of *C. vulgaris*, and, like it, without any sudden enlargement immediately behind the canine groove; and by the strong ridge which arises on each lachrymal bone close to the anterior edge of the orbit, and is continued forwards on to the line of junction of the nasal and maxillary bones, so that the naso-maxillary suture traverses the axis of the ridge, and then curves outwards, descending towards the alveolus of the tenth tooth. The premaxillo-maxillary suture is W-shaped; and its salient angles reach backwards even to the level of the posterior margin of the seventh alveolus.

3. *Crocodilus Americanus (acutus, Cuv.)*

has the slenderness of snout (even more marked) and the form of the premaxillo-maxillary suture of the preceding species; but it is at once distinguished from this and all other Crocodiles (except *C. rhombifer*) by the marked longitudinal and transverse convexity of the middle of the face, which gives the profile a totally different aspect from that of the other species, which are flat or concave in this region.

4. *Crocodilus Journei*

is another unmistakeably distinct and very remarkable species. The descriptions and figures given by Graves, Bory de St. Vincent, and Duméril and Bibron, of the unique specimen of this Crocodile in the Bordeaux Museum, would alone have compelled me to differ entirely from the view taken by Dr. Gray of the affinities of this species. These observers agree in stating that *Crocodilus Journei* has six cervical scutes, arranged as in the other Crocodiles, and, as Graves says, "separated by an interval of four inches" from the commencement of the tergal scutes, whence it is obviously impos-

sible that it can be a *Mecistops*. But, in addition to this, I had the good fortune to find, among the recent additions to that excellent osteological collection which Dr. Gray has gradually formed at the British Museum, the skull of a Crocodile obtained from a dealer in Paris, and labelled by him "Croc. de l'Orinoko." I at first imagined this Crocodile to be a *Mecistops*; but on careful investigation it turned out to be no other than the skull of a *Crocodylus Journei*, somewhat larger than the Bordeaux specimen, but, as the subjoined measurements will prove, agreeing with it in all its proportions:—

| | Inches. |
|---|------------------|
| Length from end of snout to end of ossa quadrata... | 22 $\frac{1}{2}$ |
| Breadth between outer margins of ossa quadrata ... | 9 $\frac{3}{4}$ |
| —— at the level of the anterior margins of the orbits | 5 $\frac{1}{2}$ |
| —— at the tenth tooth | 3 $\frac{1}{2}$ |
| —— at the end of the snout | 2 $\frac{3}{4}$ |
| —— of the interorbital space | 1 $\frac{3}{4}$ |
| Length of mandibular symphysis | 5 |

Now Duméril and Bibron expressly state that the length of the head of *C. Journei* equals 2 $\frac{1}{2}$ times its greatest transverse diameter, that the width of the jaws at the anterior margins of the orbit equals one-fourth the length of the head, and that at the tenth tooth it equals one-sixth the length of the head; and these are as nearly as possible, it will be observed, the relations of the same dimensions in the above list.

In the specimen in the British Museum there are eighteen teeth on each side above, and fifteen below. The Bordeaux specimen is stated to have the same dental formula, except that there are sixteen teeth in the left ramus of the mandible. The fourth and tenth maxillary teeth are stated by Graves to be as large again as the others; and the corresponding alveoli have these proportions to one another in the British Museum specimen. In fact, there can be no doubt that this skull is that of a true *Crocodylus Journei*.

But its general characters at once prove the close affinity of *C. Journei* with the other true Crocodiles, from which it differs only in its elongated and gradually tapering skull, and in the more backward extension of the mandibular symphysis*, which attains the level of the posterior margin of the sixth tooth.

In this character, and in the extreme slenderness of the snout,

* The greater proportional length of the symphysis is noted by Duméril and Bibron.

there is doubtless an approximation to *Mecistops*; but *Crocodylus Journei* is sharply separated from that genus by the characters of its teeth, and by those of its dermal armour.

5. *Crocodylus bombifrons* (*palustris*?).

All the species of *Crocodylus* which I have hitherto mentioned have, in common, the backward curvature of the premaxillo-maxillary suture to the level of the seventh tooth. But there is a species of Crocodile, about whose proper specific name I am by no means clear, in which this suture passes straight across the palate, or may even be a little convex forwards.

And not only do the skulls of this species exhibit this approximation to those of the *Alligatoridæ*, but they resemble them still further in their rounded snouts, their great width immediately behind the canine groove, and in the fact that, in young specimens, one or the other canine may be received into a pit instead of into a groove*.

In the Hunterian Collection there are seven skulls, varying in length from $5\frac{1}{4}$ inches up to 16 inches, in none of which does the crown of the premaxillo-maxillary suture extend beyond a line joining the sixth pair of teeth. In all there are two short ridges (convergent in young specimens, nearly parallel in old ones) upon the lachrymal bones, which end before reaching the anterior limits of those bones. They all have an oblique ridge on the upper jaw above the tenth tooth; and the snout attains the width which it has opposite this tooth immediately behind the canine groove. In the British Museum there are five middle-sized skulls with the same characters; but two of these have a pit on one side of the upper jaw, and a groove on the other, and one has something between a pit and a groove on each side.

Dr. Gray, has in his 'Catalogue†,' mentioned the peculiar transverse disposition of the premaxillo-maxillary suture in his *Croco-*

* In a skull of this species $14\frac{1}{2}$ inches long, in the British Museum, the vomers are completely excluded from the palate, and their anterior ends do not extend for an eighth of an inch beyond the palatine part of the palato-maxillary suture, which lies on a level with the anterior margin of the twelfth alveolus. Each vomer is $2\frac{3}{8}$ inches long, and presents the same general form as that of *Jacare*; only the anterior division is but a very small, flat and thin plate, not a quarter of an inch long. The boundary of the median nares is formed in equal proportions by the vomer and the palatine, and is opposite the fourteenth tooth. The hinder end of the vomer articulates with the end of the descending process of the prefrontal.

† 'Catalogue of the Tortoises, Crocodiles, and Amphisbænians in the Collection of the British Museum,' 1844, p. 59.

dilus bombifrons; and on examining the two crania thus named in the British Museum collection, one of which is 20 and the other 21 inches long, I can discover no distinguishing character between them and those already described. There can be no doubt then, I think, that these constant and well-marked characters, exhibited by fourteen skulls which vary in length from $5\frac{1}{4}$ to 21 inches, prove the existence of a distinct species of Crocodile, which I would provisionally term *bombifrons*.

I believe that this species has been constantly confounded with *biporcatus*, from which it may be at once distinguished by the direction of the premaxillo-maxillary suture, and by the shape of the snout behind the canine groove. I have found these distinctions to hold good at all ages; but the last-mentioned difference is far more marked in middle-aged than in either young or old specimens.

All the skulls named *Crocodylus palustris* which I have seen are referable either to *C. biporcatus* or to *C. bombifrons*. With respect to the *C. palustris* of Lesson and Duméril and Bibron, the latter authors consider it to be only a variety of *C. vulgaris*. Their description would, however, apply very well to *C. bombifrons*, as I have defined it above; and they expressly state ('Erp. Générale,' t. iii. p. 113) that all their specimens (twelve in number and varying in length from 30 centimetres to more than 3 metres) came from the East Indies or the Seychelle Islands. Now, Duméril and Bibron enumerate only three Asiatic Crocodiles—*C. biporcatus*, *C. palustris*, and *C. galeatus*, the last of which was only known to them by description; so that all the numerous Asiatic crocodiles which passed through their hands belonged either to *C. biporcatus* or *C. palustris*. On the other hand, all the skulls of crocodiles from Asia which I have met with (amounting to at least twenty) are either those of *C. biporcatus* or of the species which I have called *bombifrons*; so that I suspect the latter title will turn out to be a synonym of *palustris*.

6. *Crocodylus rhombifer*.

I have not been able to obtain any skull of this species, which, according to Cuvier's account and figures ('Oss. Fossiles,' t. ix. p. 102), resembles *C. Americanus* in the great convexity of its nasal region, but differs from it in the greater breadth of the skull, and in the strong converging preorbital ridges, which appear to be limited to the lachrymal bones. If the figures are to be trusted, however, there are other very important distinctive characters

about the cranium of this species ; for Cuvier's, fig. 2, pl. 331, which gives a view of the palate, shows the premaxillo-maxillary suture forming a nearly straight transverse line.

There remain several species of *Crocodylus* whose skulls I have not been able to examine, and of which no sufficient descriptions exist. Of these, (7.) *C. galeatus* and (8.) *C. Gravesii* (*planirostris*) would appear to be very distinct forms. (9.) *C. marginatus* is considered by Duméril and Bibron to be only a variety of *C. vulgaris* ; and they take the same view of (10.) *Crocodylus suchus*. Professor Owen, however, has figured the cranium of an Egyptian mummy under this name ('Monograph on the Reptilia of the London Clay,' Pal. Soc., 1850). In the under-view of this skull (tab. i. fig. 2), the junction of the premaxilla and the maxilla in the palate seems to be broken away ; but on the left side, the palatine process of the maxilla is entire, as far as the level of the anterior margin of the sixth tooth, and there is not a trace of a suture behind this point. Are there, then, two or more species of Crocodile in Egypt, as Geoffroy St.-Hilaire supposed ?

With regard to the distribution of the species of *Crocodylus*, *C. vulgaris*, *C. marginatus*, and *C. suchus* (?) appear to be exclusively African ; all the crocodiles from other parts of the Eastern hemisphere, which I have met with, belong, as I have stated above, either to *C. biporcatus* or *C. bombifrons*, both of which species are found in the Ganges. *Crocodylus galeatus* appears to be peculiar to Siam. *Crocodylus Americanus* and *C. rhombifer* are undoubtedly American. *C. Journei* has been supposed to be African ; but such positive evidence as exists tends rather to prove it to be an American species. Thus Bory de St. Vincent states that the Bordeaux specimen is "suspected to have come from America ;" and, as I have said, the skull in the British Museum is labelled "from the Orinoko."

Crocodylus Gravesii (*planirostris*) is supposed by Bory de St. Vincent to have been brought from the Congo ; but its real origin is not known.

Genus 5. MECISTOPS.

The cranium is elongated, and the snout slender and Gavial-like. There are eighteen slender and subequal teeth above, and fifteen below, on each side. The mandibular symphysis extends back to the level of the seventh tooth. The cervical scutes are arranged in two transverse rows, each of which contains two scutes ; and there is no space left between the posterior row and the tergal series.

This excellent genus, as established by Dr. Gray, includes Cuvier's *Crocodilus cataphractus* (which Dr. Gray considers to be the young of a species whose full-grown form was discovered by Mr. Bennett in West Africa), *Crocodilus Journei* and *Crocodilus Schlegelii*. As I have endeavoured to show, however, *C. Journei* is a true crocodile; and, as I shall point out below, Müller and Schlegel have satisfactorily proved *C. Schlegelii* to be a Gavial. Consequently *Mecistops* is at present represented by only one species, which must be called *M. cataphractus* if *M. Bennettii* of Gray is really the adult of the form which Cuvier described.

III. In the family of the GAVIALIDÆ, the snout is always very long and slender; the teeth are for the most part slender, sharp-edged, and subequal. The two anterior mandibular teeth pass into grooves, one of which lies on each side of a beak-like prominence of the premaxillæ, which carries the two anterior upper teeth. The canines are received into grooves. The mandibular symphysis extends back to at least the fourteenth tooth, and is partly formed by the junction of the splenial bones. The premaxillo-maxillary suture is always strongly convex backwards. The posterior nares are situated more forward than in the *Crocodili*. The temporal fossæ are large. The feet are strongly webbed. The dorsal scutes are not articulated; and there are no ventral scutes.

I distinguish two genera in this family, *Rhynchosuchus* and *Gavialis*.

Genus 6. RHYNCHOSUCHUS.

There are twenty teeth above, and eighteen or nineteen below, on each side; the mandibular symphysis extends to the fifteenth tooth. The posterior teeth of the upper jaw, and almost all those of the lower jaw, are received into interdental pits; the orbital margins are not raised; and the premaxillæ are hardly at all expanded. The premaxillo-maxillary suture does not reach the third tooth behind the notch.

I propose the name *Rhynchosuchus* to indicate that generic type which is at present represented by the solitary species called by Müller and Schlegel *Crocodilus* (*Gavialis*) *Schlegelii*, and admirably described and figured by them in their essay, 'Over de Krokodilen van der Indischen Archipel,' in the 'Verhandelingen over de natuurlijke Gesch. der Nederl. overzee. Bezittingen,' 1839-1844. Under the title *Crocodilus* (*Gavialis*) *Schlegelii* (p. 18), they say—"The Gavial from Borneo, when compared with

the Indian one, is principally distinguished by the following characters:—

“ 1. By its stronger form and better developed limbs.

“ 2. By its much less slender head and snout, which last does not narrow so suddenly in front of the eyes as in *G. Gangeticus*.

“ 3. By the smaller number of teeth, of which there are twenty above and eighteen below on each side, while *G. Gangeticus* has $\frac{28}{26}$ or $\frac{27}{25}$; furthermore, the teeth are stouter, less curved, and less sharp, and are disposed more perpendicularly, and the ninth tooth of the upper jaw (reckoning from the front) is considerably larger and stronger than the others; whence it follows that, just as in the true Crocodiles, the snout at the level of this tooth exhibits a lateral projection.

“ 4. By the shorter symphysis of the under jaw.

“ 5. By the absence of the swollen nasal prominence (neus-kelep), which characterizes the Gangetic Gavial.

“ 6. By the less expanded form of the tabular upper surface of the hinder part of the skull.

“ 7. By the very slight production of the edges of the orbit.

“ 8. By the large eyes.

“ 9. By the presence of a number of small nuchal shields, while *G. Gangeticus* has but one pair.

“ 10. By the strongly developed keels of the dorsal scutes.

“ 11. By the much larger scales on the under parts and on the legs of the animal.

“ 12. By the different colours with which it is variegated.”

These authors further point out that the vomers appear for a small space in the posterior part of the palate, that the opercular or splenial bones join in the symphysis of the lower jaw, and that the cervical and dorsal scutes form one continuous shield; and they represent the two anterior mandibular teeth passing in grooves on either side of the end of the premaxilla. In fact, they fully and completely establish the fact that their new species belongs to the *Longirostres* of Cuvier, or to the Gavials of later writers.

Under these circumstances, it is somewhat surprising to find the deliberate conclusions of these careful investigators set aside in the following brief passage:—

“ This Bornean species (*C. Schlegelii*) was, in fact, originally described as a new species of Gavial; but the nasal bones, as in the fossil from Sheppey, figured in t. ii. 15, extend to the hinder

border of the external nostril."—Owen, *Fossil Reptilia of the London Clay, Crocodilia*, p. 15: 1850.

Müller and Schlegel give remarkably clear and beautiful figures of the skull of their Gavial; and these show at once that the nasal bones do not "reach the hinder border of the external nostril," but meet the premaxillaries at a point very distant from that border, viz. opposite the ninth tooth. Even did the nasal bones reach the posterior boundary of the nostril, such a character would not outweigh those derived from the relations and number of the teeth, the structure and extent of the mandibular symphysis, and the disposition of the dermal scutes,—all of which are so clearly and definitely set forth by Müller and Schlegel, that it seems difficult to understand how any one who had consulted the original memoir could have overlooked them.

It was possible, however, that Müller and Schlegel, notwithstanding their great opportunities, might have erred in their statements; and I therefore gladly seized the opportunity of testing their description by comparing it with an authentic skull of the species in question, from New Guinea, in the collection of the British Museum.

I have found the statement of Müller and Schlegel minutely accurate in almost all points; and there cannot be the slightest doubt, not only that the Schlegelian crocodile is one of the *Gavialidæ*, but that it forms a distinct generic type in that family, as different from *Gavialis* as *Caiman* is from *Jacare*, or *Mecistops* from *Crocodylus*.

The following are the most important measurements of the skull of *Rhynchosuchus Schlegelii* in the British Museum collection:—

| | Inches. |
|--|-----------------|
| Length from the end of the premaxilla to that of os quadratum..... | 23 |
| Breadth from outer edge of one os quadratum to that of the other | 8 $\frac{3}{4}$ |
| Breadth across the face in front of the orbits | 4 |
| „ at the 9th tooth | 2 |
| „ at the 5th tooth | 1 $\frac{1}{2}$ |
| „ at the 3rd tooth | 1 $\frac{3}{4}$ |
| „ of the beak-like curved process which carries the two anterior teeth | 1 |
| Mean width of lower jaw from symphysis to extremity | 1 $\frac{5}{8}$ |

| | Inches. |
|--|----------------|
| Length | 12 |
| No tooth measures transversely more than | $\frac{5}{16}$ |

The face is very smooth; but a slight longitudinal groove runs down on each side from the anterior margin of the orbit for about two inches. Anteriorly to this point the snout retains a nearly even diameter as far as the ninth tooth, in front of which it suddenly narrows a little, retaining nearly the same dimensions to the fourth tooth, where it widens a very little, and then suddenly narrows to the terminal beak. The lower jaw does not expand at all at its extremity. The nasals join the premaxillaries opposite the ninth tooth, and the splenial bones, in the lower jaw, end opposite the tenth mandibular tooth, as the figures of Müller and Schlegel show. The vomers appear between the inner edges of the palatines posteriorly, as a thin bony band $1\frac{3}{8}$ inch long by $\frac{1}{8}$ inch wide, which tapers at each end and is divided by a longitudinal suture. The ninth tooth of the upper jaw is stronger than the rest.

The only point in which the description of Müller and Schlegel seems to me to be incomplete* is with regard to the disposition of the teeth. They say—"The teeth of *C. Schlegelii*, as regards their form and development, more nearly resemble those of the true Crocodiles; but in the way in which the teeth of the two jaws are opposed, there is the most complete resemblance between our species and the Gangetic Gavial,—both which species differ from all other crocodiles in the circumstance that when the mouth is shut, all the teeth of the under jaw project outside the lateral margin of the upper jaw" (*l. c.* p. 22).

What I find is this:—The anterior teeth of both the upper jaw and the mandible are long, slender, sharp-edged, and slightly curved. The posterior eleven, on each side, in the upper jaw, are short, straight, conical, and constricted below their crowns. There are deep interdental pits between the ten posterior mandibular teeth, into which the opposed teeth of the maxilla are received when the jaws are closed. All the mandibular teeth, except the two anterior and the fourth pair, pass into like pits in the upper jaw. The anterior eight teeth on each side of the upper jaw pass straight down outside the lower jaw. In the Gangetic Gavial the relations of the teeth of the two jaws appear to me, as I shall state below, to be very different.

* Or it is possible that the *Rhynchosuchus* from New Guinea, which I have examined, is specifically distinct from the Bornean form.

Rhynchosuchus Schlegelii inhabits the inland lakes of Borneo, and is found in New Guinea.

Genus 7. GAVIALIS.

There are twenty-seven or twenty-eight teeth in the upper, and twenty-five or twenty-six in the lower jaw. The mandibular symphysis extends to the twenty-third or twenty-fourth tooth. The lateral teeth of both jaws are, all but the very hindmost, directed obliquely downwards (or upwards), forwards or outwards, and are not received into interdental pits. The anterior margins of the orbits are raised. The premaxillæ and the end of the mandible are greatly expanded. The premaxillo-maxillary suture reaches the level of the fourth tooth behind the canine notch.

The only true *Gavialis* is the well-known *G. Gangeticus* from the East Indies. In this 'Gavial,' or 'Garrhial,' the vomers are slender bones which do not extend further forwards than the level of the twenty-second or twenty-first tooth, and have but a very short and slender representative of the anterior flattened division of the bone in *Jacare*; posteriorly they extend back to the level of the descending processes of the prefrontals. In a skull 25 inches long the vomers have a length of about 4 inches, extending as they do a little further forward than the palato-maxillary suture. The median nares are opposite the twenty-fifth tooth.

All the *Crocodylia* which I have enumerated are provided with two perfectly distinct kinds of dermal armour,—the one consisting of plates of horn, produced by a modification of the superficial layer of the epidermis; the other composed of discs of bone marked by a peculiar pitted sculpture on their outer surfaces, and developed within the substance of the dermis. To the former I shall apply the term "scales;" the latter are what I have denominated "scutes."

All recent *Crocodylia* have both scales and scutes in the dorsal region of the body, the scutes underlying, and having the same general form as, the scales. In all, the ventral region of the body is also covered with scales which have a very definite shape; but in no recent *Crocodylian* which I have examined, save those species which are included in the genera *Caiman* and *Jacare*, are there any scutes in the ventral region.

Again, in the genera *Alligator*, *Crocodylus*, *Mecistops*, *Rhynchosuchus*, and *Gavialis*, the edges of the scutes, except those of the two median longitudinal rows, are hardly ever united by sutures,

nor do the posterior margins of those in each transverse row overlap the anterior margins of the succeeding row. At any rate, there is no flat, bevelled, articular facet on the outer surface of the anterior margin of a scute, for articulation with the inner surface of the posterior margin of its predecessor. In the genera *Caiman* and *Jacare*, however, the lateral edges of all the scutes of the dorsal and ventral shields are united by serrated sutures; and the anterior end of the outer face of each is provided with a well-marked smooth facet, which is overlapped by the smooth under-surface of the scute in front of it.

I first noticed the remarkable structure of the dermal armour of these *Alligatoridæ* in the skin of a *Jacare* (*sp. incerta*), wanting the end of the tail, but which must have belonged to an animal between five and six feet in length. It had long been in my possession; but I had never before had occasion to study its characters minutely.

The horny scales, which had the appearance of thin tortoise-shell, could be readily peeled off (especially by the aid of a little caustic potash); and then the white surface of the subjacent bony scute upon which they were modelled came into view. It is to be understood, however, that the inner surface of the scale corresponded only in its general form with the outer surface of the scute; for it did not dip into the pits with which the latter is sculptured. These are in fact filled by the dry dermis which extends over and encloses the scute, a very thin layer (bearing the rete mucosum) being interposed between it and the scale; so that the pitted sculpture does not come out well until the scutes have been boiled.

The *dorsal* scutes are both carinated and angulated. By the application of the former term, I mean to indicate that, along a median or submedian longitudinal line, their substance is more or less elevated, so as, in many cases, to form a very prominent crest. This crest always subsides before it reaches the anterior margin of the scute, though it may extend beyond the posterior margin. Its highest point is always behind the centre of the scute, and is devoid of sculpture. The sculpture however seems to radiate from this point, inasmuch as it consists, on the greater part of the scute, of distinct pits, which are usually round towards the centre, but towards the periphery become ovals with their long axes directed towards the point in question.

The smooth inner surfaces of the scute shelve towards a depression which corresponds with the external ridge, under which the

sides of the scute seem to meet in an angle. This may be called the 'angulation' of the scute. From before backwards, the inner surface of the scute is a little convex. The scute is thickest in the middle; posteriorly, it thins off to an edge and overlaps its successor; anteriorly, its outer surface is bevelled off at an acute angle with the inner, so as to give rise to a smooth shelving surface—wide from side to side, narrow from before backwards—forming the 'articular facet,' which is overlapped by the inner surface of the posterior edge of the preceding scute. I have termed this the 'articular facet;' but it must not be supposed that there is anything like a true joint between the opposed facets of the overlapping and overlapped scutes; on the contrary, they are at once separated and connected by the dermal connective tissue.

The posterior margin of the articular facet is separated by a deep transverse groove, divided by little partitions into as many pits, from the rest of the sculptured surface; but there is no trace of any suture dividing the scute into two portions. The lateral margins of each scute are united by serrated sutural edges with those which lie next to them in the same transverse row; so that each row forms a nearly solid flat bony bar, composed, in the middle of the back, of as many as ten distinct scutes. The outer edges of the outermost scutes only, thin off and exhibit no sutural serration, inasmuch as they are not directly connected with any other scutes.

The median line of the back corresponds in general with the suture between the two middle scutes of each transverse row; so that the scutes are disposed symmetrically on either side of that line. Furthermore, the anterior part of the inner surface of each of the two middle scutes is connected by ligament with the extremity of the spinous process of a vertebra; at least, this is the case in the dorsal, lumbar, sacral, and anterior caudal regions.

The scutes which protect the *ventral* side of the body, from the throat backwards, are four-sided and similar in their ornamentation to the dorsal scutes; but they exhibit neither ridge nor angulation, their outer and inner surfaces being parallel, and either nearly flat or evenly curved. Each forms, in fact, a segment of a large cylinder, inasmuch as the whole ventral shield is convex transversely, being nearly flat in the middle and much bent up at the sides. The dorsal shield, taken as a whole, is, on the contrary, nearly flat. The lateral edges of the ventral scutes interlock suturally; and their anterior and posterior edges are overlapped and overlap, just like the dorsal scutes. The outer edges of the

outermost ventral scutes thin off and are not united with any bony element; and the ventral, like the dorsal scutes, are usually arranged symmetrically on either side of the median sutural line. There may be as many as twenty-two scutes united by their lateral sutures into a single strong, curved, transverse, bony, bar-like segment of the ventral armour.

Throughout the neck and body, and as far as the commencement of the tail, the ends of the dorsal and ventral bony bars, whose sum may be regarded as a dorsal and a ventral shield respectively, are separated by an interval of integument, in which only small scattered scutes are visible. The physiological import of this arrangement becomes obvious when we consider in what manner the animal breathes; and indeed the integumentary interval answers very precisely to the leather which connects the two boards of a bellows. Again, though the limbs are themselves covered with articulated scutes, they are afforded free play upon the body by this flexible interspace. Immediately behind the hind legs, the ventral and dorsal shields unite; and the tail is from that point surrounded by a succession of bony hoops, each of which corresponds with a vertebra, the segments of the exoskeleton answering to those of the endoskeleton.

The most remarkable feature about the ventral scutes, however, and that in which they differ most widely from the dorsal ones, consists in the fact that each scute is composed of two distinct pieces, an anterior and a posterior, which unite together by a transverse serrated suture. The anterior piece or 'semi-scute' may attain to three-quarters the length of the posterior, and it has exactly the same width. The anterior semi-scute bears the articular facet and the transverse pitted groove, whose posterior wall is just in front of its hinder edge, or in other words, of the suture, when the two semi-scutes are united.

Such are the general characters and mode of arrangement of the dorsal and ventral armour of *Jacare*. But there remain many noteworthy peculiarities in the disposition and number of the components of each band of the armour.

Thus, in the *dorsal shield* there are two rows of nuchal scutes, each containing eight separate keeled bony plates; and of cervical scutes there are five rows, the two anterior of which contain four angulated and carinated scutes each, while the three posterior contain only two scutes each. All these scutes, except the anterior row, have articular facets; and all those of each row are united suturally. Of dorsal scutes there are thirty transverse rows up to

the median keel of the tail, which commences with the thirty-first row. The number of scutes in each row is as follows:—

| Rows. | Scutes. | Rows. | Scutes. |
|-----------------------|---------|-------------------------|---------|
| 1, 2, 3, 4 | 6 | 25, 26..... | 5 |
| 5, 6, 7, 8, 9, 10, 11 | 10 | 27, 28..... | 4 |
| 12, 13 | 8 | 29, 30 | 4 |
| 14, 15 | 6 | | |
| 16, 17, 18 | 4 | 31, 32, 33, 34 | 5 |
| 19 | 6 | The rest of the tail is | |
| 20 | 8 | wanting. | |
| 23, 24 | 6 | | |

Throughout the dorso-lumbar and sacral regions (*i. e.* up to the nineteenth row), the median scutes are hardly keeled at all, while the outer ones are the more strongly carinate the more external they lie.

In the caudal region, the second scute from the middle line, in the twenty-third row, has a strong keel and angulation, which grows stronger in the corresponding scutes up to the thirtieth inclusive, until the superior and lateral faces of these scutes, in the twenty-ninth and thirtieth rows, are inclined to one another at a right angle and very strongly keeled. I have said that, as a rule, the median line is occupied by a suture between two median scutes; but in the caudal region*, in the twenty-fifth row (which corresponds with the sixth caudal vertebra) the two median scutes are replaced by one flat scute, so that there is no suture in the middle line. In the twenty-sixth row there is a similar arrangement, but the flat scute is smaller; and in the twenty-seventh no trace of it is left, so that the strongly keeled lateral scutes meet in the middle line, which is again occupied by a suture. This continues up to the thirty-first row, when the median scute reappears as a thin vertical plate, broader below and in front, where it articulates with the median lateral scutes, than above and behind, where it exhibits a free edge only covered by the horny epidermis. It is thus that the serrated dorsal crest of the tail is formed. The scutes of the crest exhibit only very small round and distant pits.

The *ventral shield* begins in the neck just behind the level of

* The second and third cervical rows in *Caiman palpebrosus* and *trigonatus* also contain a median scute, and consequently an odd number of scutes. In *Caiman trigonatus*, the third to the ninth supra-caudal rows have each a median single scute.

the anterior margins of the orbits: the fifteen anterior rows may be termed subcervical, as they lie in front of the thorax. In the first six rows the scutes are very small, and increase in number up to twelve in a row. In the next six rows there are ten scutes in a row, and in the last three, twelve. All these rows are symmetrically divided by the median line. In the three hinder rows the inner scutes are longer than the outer ones; and this is most markedly the case in the fifteenth row, whose innermost scute is half as long again as the corresponding one of the preceding row, and more than three times as long as the outermost of its own row.

The sixteenth row differs from its predecessors and successors, and may be termed the axillary row. It is bent upon itself with an angle open forwards, and is divided into two halves (each of which contains seven scutes) by the union of the middle scutes of the fifteenth subcervical with those of the first row of what may be termed the subdorsal scutes, or those which lie under the thorax and abdomen. Of subdorsal and subcaudal scutes there are, up to the broken-off end of the tail, thirty-seven rows, with the following numbers of scutes:—

| Rows. | Scutes. | Rows. | Scutes. |
|-----------------|---------|-------------|---------|
| 1 | 12 | 22 | 18 |
| 2 | 10 | 23 | 22 |
| 3, 4, 5 | 12 | 24 | 22 |
| 6, 7, 8, 9..... | 14 | 25 | 20 |
| 10 | 16 | 26—28 | 18 |
| 11 | 14 | 29—31 | 16 |
| 12—17 | 14 | 32—34 | 14 |
| 18—20 | 12 | 35 | 12 |
| 21 | 14 | 36, 37..... | 10 |

It will be noticed that there are three more rows of ventral than of dorsal scutes. On endeavouring to ascertain how this came about, I observed that the first subdorsal was a good deal behind the first dorsal row, though the eighth to the twelfth dorsal corresponded exactly with the eighth to the twelfth ventral rows. In the anterior part of the body, therefore, there is a clear general correspondence between the segments of the dorsal and those of the ventral armour.

In the caudal region, again, I found that the twenty-fourth ventral row, which is the first of the caudal rows not excavated by the

vent, corresponded exactly with the twenty-first dorsal row. It was clear, therefore, that three ventral rows were interpolated somewhere between the twelfth and twenty-first dorsal rows ; and on close examination I found this interpolation to arise from the doubling of the fourteenth, fifteenth, and sixteenth ventral rows.

I have examined *Jacare fissipes* and *nigra*, *Caiman trigonatus*, and *C. gibbiceps*, in the British Museum ; and I find, in all, dorsal and ventral armour having the same essential arrangement as that just described. A specimen of *Caiman palpebrosus* about two feet long, the opportunity of examining which I owe to Dr. Grant, exhibits the dorsal and ventral shields (whose scutes are in the main similarly arranged) very beautifully ; and a young *Jacare* of about 18 inches in length, for which I am indebted to the kindness of the same gentleman, proves that the scutes are developed even in specimens of this age. I have no hesitation therefore in expressing my belief that this singularly complete dermal armour will be found to be characteristic of all the species of the genera *Caiman* and *Jacare*. On the other hand, I have examined *Alligator Mississippiensis*, *Crocodilus vulgaris*, *C. biporcatus*, *C. Americanus*, *C. rhombifer*, and *C. bombifrons*, *Mecistops cataphractus*, and *Gavialis Gangeticus*, of various ages and sizes, without having been able to discover a trace of ventral scutes. This is the more remarkable, as the well-marked ventral and dorsal shields of many of the ancient *Teleosauria* would lead one to expect a corresponding exoskeleton (if anywhere) in their nearest allies, the modern *Gavialidæ*. However, *Goniopholis*, with its strong armour, is more like an ordinary Crocodile ; and I have recently discovered that a true Crocodile in some respects curiously similar to *C. bombifrons* (*C. Hastingsiæ*) was covered with scutes exceedingly like those of the modern *Caiman* and *Jacare*.

In minute structure the bony scutes of *Jacare* closely resemble those of such a fish as a Sturgeon : a middle layer, containing so many canals as to appear almost cancellated in longitudinal or transverse section, is covered externally by a thin, and internally by a thick, layer composed of bony lamellæ, nearly parallel to the plane of the scute. Round the canals of the middle layer, the bony lamellæ are disposed concentrically, to a greater or less extent. The lacunæ are of very various shapes ; and there are perhaps as many short as elongated forms. The canals of the middle layer communicate by large branches with the inner, by smaller and fewer branches with the outer surface of the scute.

In the young *Jacare* mentioned above, I found the dermis to be

distinguishable into two layers. The more superficial of these is thin, made up of irregular or formless connective tissue, and contains many ramified pigment-masses. Its smooth outer surface underlies the rete mucosum. Internally, it passes into the second or deep layer, which consists of successive layers of distinctly fibrous connective tissue, disposed in definite parallel bundles, and having a very regular arrangement. Throughout a space corresponding with the area of each scale, in fact, the bundles of each layer cross those of the succeeding layer at right angles; and the successive tiers of bundles are tied together by short cords disposed perpendicularly to the planes of the tiers. A corresponding arrangement of the bundles of connective tissue has long been known to obtain in the dermis of Fishes and *Batrachia*. At each end of this small "mat" of connective tissue, the bundles, if I may so say, fray out; and at the anterior end, the layers, loosened in texture, bend upwards, spreading out at the same time to become continuous with the fibres of the "mat" in front. In consequence of the matting under the quadrate surface of each scale, the dermis has a peculiar facettèd aspect, quite apart from any osseous deposit. Where bony scutes are formed, they appear as very thin perforated plates in the most superficial portion of the deep layer of the dermis; so that there is a single thin layer of dense connective tissue above them, while below them are all the rest of the denser and deeper lamellæ of the dermis. Through the apertures in this primitive osseous plate (the rudiment of the middle layer of the future scute), bundles of connective tissue extend, connecting the deep with the superjacent lamellæ.

If a thin section is made and decalcified with weak acid under the microscope, the calcareous matter, as it is dissolved away, leaves an obscurely fibrous matrix of a different aspect from the surrounding connective tissue, and the endoplasts, or nuclei, of this matrix are seen each to have occupied the centre of a lacuna.

Again, the rudimentary scute lies in the dermis as in a sort of pocket, the superficial and deep walls of which separate from it with great ease; and in good thin sections made through the dermis and scute, there seems to be no direct connexion between the substance of the scute above and below, and the connective tissue with which it is in contact. Nor could I satisfy myself that the margins of the scute were continuous with the surrounding bundles of connective tissue. However, the specimen had been a very long time in spirit; and I am unwilling to lay too much stress upon these observations, which tend to negative the supposition

that the scute proceeds from the direct calcification of the connective tissue of the dermis.

On the other hand, I must remark that horizontal sections of the scutes have presented oblique parallel fissures, sometimes crossing one another, which might readily be supposed to correspond with the lines of separation of ossified bundles of connective tissue.

NOTE.—During a recent visit to Paris, my friend Mr. Busk was kind enough to examine the specimens of recent *Crocodilia* in the Museum of the Jardin des Plantes, with reference to certain points to which I requested his attention. Mr. Busk informs me that there is no doubt about the transverse direction of the premaxillo-maxillary suture in *Crocodilus rhombifer*; and his statements lead me to entertain no question that *C. bombifrons* is a synonym of *C. palustris*.

In the typical specimens of *C. marginatus* and *C. suchus* of Geoffroy St.-Hilaire, the premaxillo-maxillary suture extends back to the level of the seventh tooth.

Mr. Busk has furthermore pointed out to me the existence of another American species of Crocodile—*C. Moreletti*, which has been described by M. Auguste Duméril in his “Description des Reptiles nouveaux ou imparfaitement connus,” &c., ‘Archives du Muséum,’ t. vi. 1852.

This species inhabits lake Flores, in Yucatan; and it is said by M. Duméril to approach *C. Americanus*, from which it differs in the proportions of the skull and in the characters of the dermal armour.

June 21st, 1859.

On the Habits of the “Aye-Aye” (*Cheiromys madagascariensis*, L., Cuv.). By the Hon. H. SANDWITH, M.D., C.B., Colonial Secretary of the Mauritius. Communicated by Prof. OWEN, F.R.S., V.P.L.S.

[Read April 7th, 1859.]

“Mauritius, Jan. 27, 1859.

“MY DEAR MR. OWEN,—After very great difficulty and much delay, I have at length obtained a fine healthy male adult *Aye-Aye*; and he is now enjoying himself in a large cage which I have had constructed for him.

“He is a most interesting little animal; and from close observa-

tion I have learnt his habits very correctly. On receiving him from Madagascar, I was told that he ate bananas; so of course I fed him on them, but tried him with other fruit. I found he liked dates,—which was a grand discovery, supposing he be sent alive to England. Still I thought that those strong rodent teeth, as large as those of a young Beaver, must have been intended for some other purpose than that of trying to eat his way out of a cage—the only use he seemed to make of them, besides masticating soft fruits. Moreover, he had other peculiarities,—*e.g.*, singularly large, naked ears directed forward, as if for offensive rather than defensive purposes; then, again, the second finger of the hands is unlike anything but a monster supernumerary member, it being slender and long, half the thickness of the other fingers, and resembling a piece of bent wire. Excepting the head and this finger, he closely resembles a Lemur.

“Now as he attacked, every night, the woodwork of his cage, which I was gradually lining with tin, I bethought myself of tying some sticks over the woodwork, so that he might gnaw these instead. I had previously put in some large branches for him to climb upon; but the others were straight sticks to cover over the woodwork of his cage, which *alone* he attacked. It so happened that the thick sticks I now put into his cage were bored in all directions by a large and destructive grub called here the *Moutouk*. Just at sunset the Aye-Aye crept from under his blanket, yawned, stretched, and betook himself to his tree, where his movements are lively and graceful, though by no means so quick as those of a squirrel. Presently he came to one of the worm-eaten branches, which he began to examine most attentively; and bending forward his ears, and applying his nose close to the bark, he rapidly tapped the surface with the curious second digit, as a woodpecker taps a tree, though with much less noise, from time to time inserting the end of the slender finger into the worm-holes, as a surgeon would a probe. At length he came to a part of the branch which evidently gave out an interesting sound, for he began to tear it with his strong teeth. He rapidly stripped off the bark, cut into the wood, and exposed the nest of a grub, which he daintily picked out of its bed with the slender tapping finger, and conveyed the luscious morsel to his mouth.

“I watched these proceedings with intense interest, and was much struck with the marvellous adaptation of the creature to its habits, shown by his acute hearing, which enables him aptly to distinguish the different tones emitted from the wood by his gentle

tapping; his evidently acute sense of smell, aiding him in his search; his secure footsteps on the slender branches, to which he firmly clung by his quadrumanous members; his strong rodent teeth, enabling him to tear through the wood; and lastly by the curious slender finger, unlike that of any other animal, and which he used alternately as a pleximeter, a probe, and a scoop.

"But I was yet to learn another peculiarity. I gave him water to drink in a saucer, on which he stretched out a hand, dipped a finger into it, and drew it obliquely through his open mouth; and this he repeated so rapidly, that the water seemed to flow into his mouth. After a while he lapped like a cat; but his first mode of drinking appeared to me to be his way of reaching water in the deep clefts of trees.

I am told that the *Aye-Aye* is an object of veneration at Madagascar, and that if any native touches one, he is sure to die within the year; hence the difficulty of obtaining a specimen. I overcame this scruple by a reward of £10.

"I quite despair of obtaining the bones of the *Dinornis* or *Dodo*, though I have made every effort. I shall always be proud to be of service.

"Believe me, yours very faithfully,

"H. SANDWITH."

On the Moulting of the common Lobster (*Homarus vulgaris*) and Shore Crab (*Carcinus mænas*). By S. JAMES A. SALTER, M.B., F.L.S., F.G.S.

[Read April 7th, 1859.]

I AM induced to bring this subject before the Linnean Society, on account of the singularly perfect specimen of the thrown-off slough of a Lobster which I have now an opportunity of exhibiting, and because the process by which it was shed was witnessed and carefully watched by two competent observers—by my friend Mr. Robert Cooke, of Scarborough, a Fellow of this Society, and by the intelligent wife of the Curator of the Scarborough Museum, in an aquarium in which institution the occurrence took place.

The methods by which certain of the Decapod Crustaceans cast their old shells in the process of renewal and growth have already been made the subject of observation and record.

Réaumur, as early as 1712, and again in 1718, saw and described

the sloughing of the common freshwater Crayfish (*Astacus fluviatilis*).

It was witnessed in the common edible Crab (*Cancer Pagurus*) by Mr. Couch, in 1833.

Subsequently the moulting-process was observed by Mr. Gosse, in the Spinous Spider-crab (*Maia Squinado*).

Beyond these three recorded examples, I believe that the actual operation of moulting in Decapods has never been seen, though the sloughs of our common Crustacea, and the animals themselves but recently emerged from their old shells, are familiar to all marine zoologists.

There is no recorded account of the moulting of the Lobster, that I have been able to discover.

The Lobster from which the slough was obtained, and whose operations are the subject of this communication, was an inhabitant of a large marine aquarium in the Museum at Scarborough. The period was July 1857. The aquarium contained the ordinary assemblage of sea-shore animals, and a considerable collection of vegetation, which consisted of *Ulva*, *Fucus*, and other common sea-weeds.

For two days previous to its throwing off the shell, the Lobster was observed in a very peculiar attitude, and to be very busily engaged. Its abdomen was permanently and stiffly erected and straight; while the animal, in this rigid attitude, was hard at work detaching and carrying all the soft sea-weed it could collect to one end of the aquarium, where it thus accumulated a large mass of vegetation, which was afterwards destined to become a screen and protection for its soft body. At the same time, and by the same means, a clearing was made at the other end of the tank, in which it had space for the evolutions which were subsequently necessary for the extrication of its body.

The Lobster remained in the peculiar rigid attitude I have described, during the entire two days previous to the moult. On the third day, a crack was observed along the membrane which unites the dorsal surface of the first abdominal ring with the carapace; and when these parts became separated by about half an inch, the bright-blue membrane of the new shell being plainly visible beneath, the operation of extricating the abdomen commenced. By a strong vibratory action of the whole abdomen, principally in a lateral direction, one segment was, at first, protruded through the split; and this was followed by an interval of complete repose, during which the animal remained quite mo-

tionless. Then, by another vibratory action, the second segment was extricated; then followed an interval of repose, when the third was withdrawn; and so on till, at last, the entire abdomen, after having been bent double upon itself, was turned completely out backwards, and then, elongated and compressed, remained above and parallel to the empty shell that it had occupied, and which was still attached to the under surface of the cephalo-thorax. Hitherto the only orifice of escape consisted in the transverse splitting of the first abdominal segment from the carapace, on the dorsal surface. None of the abdominal segments separated from each other.

Thus far the extrication had commenced at the front of the abdomen, and had progressed from before backwards. It was now observed that the carapace had split from behind forwards, the fissure commencing posteriorly at the transverse split between the carapace and the first abdominal segment, and reaching forwards to the apex of the rostrum, which, however, it did not absolutely divide. The two halves of the carapace then separating posteriorly, the interval between them, together with the original transverse slit, constituted a trifid opening, through which the rest of the animal escaped.

The escape of the cephalo-thoracic portion was effected from behind forwards. First the posterior ambulatory legs were loosened and withdrawn; then followed the next pair; and this process was continued from behind forwards, pair by pair—the withdrawal of each pair of legs being followed by an interval of repose. The limbs were withdrawn very readily from the old shell, slipping out of it as a leg would from a loose boot. No apparent effort accompanied these operations so far.

The extrication of the claws, however, was attended with much and violent exertion. This consisted of two powerful and sudden tugs, the soft abdomen of the Lobster pressing by its under surface upon the upper surface of the empty shell. By this means the soft chelæ were drawn through the narrow joints of the old shell, exhibiting strong, unmistakeable marks of the violence and pressure to which they had been subjected. The escape of the chelæ from their unyielding incasement was not aided by any splitting of the old shell, the large soft hands being drawn by compression through the narrow joints, as a wire is drawn through the contracting holes of a draw-plate.

The efforts for the withdrawal of the chelæ were the last, and succeeded in completely freeing the Lobster from its old case.

Not only the claws, but the parts of the mouth, the antennæ, and the eyes, were all unsheathed; and with the last tug the regenerate Lobster plunged backwards, and entirely escaped, above and behind the now empty shell—its former tenement.

The operation, from first to last, occupied about twenty minutes, and was performed entirely in view, in that part of the aquarium which the Lobster had cleared of sea-weed.

Immediately after emerging from the old shell, the Lobster, was much deformed: there was a general elongation of the whole animal; but this was most remarkably the case with the claws, which were quite drawn out of shape. During the few subsequent hours, both the body and the claws became shorter and much enlarged. This increase of size did not result from any unfolding of membrane of the shell previously plicated, as no folds were observable immediately after the emergence of the animal, but from a simple distension, apparently from the imbibition, either by swallowing or by endosmosis, of considerable quantities of water. The membrane of the new shell was perfectly soft, and of a bright blue colour. At first the Lobster was shy and quite inactive, retiring to and remaining concealed among the accumulated sea-weed; but in a few hours it emerged from its retreat, and moved freely about the aquarium. The membrane of the new shell remained soft for some days, but on the seventh it appeared to have become perfectly calcified.

These are the details of the exuviation of the Lobster whose cast-off shell is before the Society. By a happy accident, the same observers had an opportunity of witnessing the sloughing of another Lobster, in the month of November following. The process was identically the same in every particular; but it was observed that the subsequent calcification of the shell did not take place till after the lapse of about fourteen days,—a circumstance probably dependent on a lower temperature and a less active nutrition. These are, I believe, the only two instances in which the exuviation of the Lobster has been actually witnessed; but there exist specimens of sloughs which are entirely in keeping with this description. In the fish-house of the Zoological Society of London there are two specimens which were cast in the tanks there; and in each there is the same transverse splitting of the carapace from the abdomen, and the longitudinal splitting of the carapace itself, without any other opening for the escape of the animal.

One or two general observations are suggested by the foregoing

description. In the only examples of the exuviation of macrourous Decapod Crustaceans, there exists a singular diversity in the process itself. In *Astacus*, as described by Réaumur, the process commences with the escape of the cephalothorax; in *Homarus*, as I have now described it, it begins by the emergence of the abdomen. In *Astacus* the carapace is detached and thrown off bodily and unbroken, being severed from its attachments with the lateral portions of the cephalothorax, as is the case in the Brachyura; whereas in *Homarus* the lateral attachments of the carapace remain, whilst the plate itself is split up the centre. In *Astacus*, as is also the case in the Brachyura, the thrown-off slough is uniformly left resting on its dorsal surface; in *Homarus* the reverse is uniformly the case. But the most striking dissimilarity is to be found in the circumstances *stated* to attend the liberation of the chelæ. Prof. Bell, in the Introduction to his 'History of the British Stalk-eyed Crustacea,' remarks—"It is impossible to imagine that the crust of the legs, and especially of the great claws of the larger species, could be cast off, unless it were susceptible of being longitudinally split" (p. 35), and he then proceeds to give the account detailed by Réaumur of the longitudinal splitting of the shell in the neighbourhood of the joints of the claws in *Astacus*, so as to allow of the extrication of the hands. Nevertheless, however impossible it may appear for the chelæ to escape without this splitting, no such circumstance occurs in the exuviation of *Homarus vulgaris*; and when we consider that the hands of *Astacus* are small in proportion to the wrist-joints, and that in *Homarus* they are larger in proportion to those joints than in any other of the Macroura, this dissimilarity in the mode in which the claws escape is the more remarkable, and, I confess, to my own mind it suggests the suspicion that the distinguished and usually most accurate French naturalist to whom I have referred may possibly in this instance have been led to consider as a fact that which was to him a supposed necessity*.

Since the foregoing account of the moulting of the Lobster was written, I have dredged a specimen of the common shore-crab (*Carcinus mænas*), in the act of casting its shell. This little crustacean had taken refuge, no doubt for the safe and secret per-

* The suspicion above expressed has been fully confirmed by observations made by Mr. J. J. Bennett, the Secretary of the Linnean Society. Mr. Bennett informs me that, in an aquarium in his possession, an *Astacus fluviatilis* has twice cast its shell, and the process of moulting was on each occasion accomplished without any splitting of the shell at the joints of the claws.

formance of sloughing in a forest of *Zostera*, on one of the mud banks in Poole Harbour, and while scraping these weeds with a keel-drag it fortunately fell into my net. It shows how the Brachyura leave their old shells by the horizontal splitting away of the carapace from the other portions of the shell—the carapace itself remaining entire; and it also shows (and this was my principal object in exhibiting the specimen) the enormous amount of increase of size upon emerging from the shell, and the rapidity with which that increase takes place. The animal, as now seen, is in exactly the same state as when taken out of the water, and its bulk is probably some four times larger than the area of the shell in which it had been encased only a few minutes before. I retained the Crab in connexion with its old shell, and prevented its further escape by wrapping it in paper, so that it could not move its limbs. I thought such a specimen would be telling and illustrative, and that the old shell, being in contact with the new, would afford facilities for contrast. In this condition the Crab died, and, being out of water some time, it became dry, and the soft new shell collapsed and bulged in; but, upon placing the dead Crab in sea-water, the soft shell very speedily imbibed sufficient fluid to distend it to its previous dimensions. This of course was simply the effect of endosmosis. Mr. Couch, in describing the moulting of the common Edible Crab (*Cancer Pagurus*), speaks of its *drinking* large quantities of water, and *thus* becoming distended; but I rather think that the distension takes place by endosmosis, even during life. There are two circumstances which militate against Mr. Couch's opinion:—first, the rapidity with which the distension occurred in the Crab I have just exhibited, while still in the act of moulting; and secondly, that after death the same distension occurred when the Crab was immersed in sea-water; in which case it could only be by endosmosis. Indeed to me it seems very probable that this very endosmosis, when the water once comes in contact with the new, uncalcified shell, may, by distending it, be the main agent in the breaking open and dis severing of the elements of the old shell.

On the Shell-bearing Mollusca, particularly with regard to Structure and Form. By ROBERT GARNER, Esq., F.L.S.

[Abstract of a Paper read before the Society.]

THE author commences the paper, of which the following is the substance, with some general observations on the morphology of

animals. He thinks that the idea of an ascending and successive scale or chain of creation is, in the main, correct, when the great classes, and not species or genera, are made the links,—the disturbing or modifying influences being due to modes of life, food, habitat, &c., and causing a different (say the quinary) distribution. He is an advocate, too, for the doctrine of one fundamental plan of organization, and thinks that, in the zoophyte, there is a real union of both the animal and vegetable *nisus*.

The great divisions of this chain, the *radiate*, *articulate*, *molluscous*, and *vertebrate*, constitute an ascending series; the links of the chain, so to speak, being in each case, for such an extent, of a particular pattern; but, nevertheless, one of the highest mollusks may surpass in organization one of the lowest fishes, or an articulate creature a mollusk. The author considers such great divisions of animals, as well as minor ones—the gasteropodous mollusks, for instance—as realities, and not mere abstractions; and that they are independent of the circumstances of food, habitat, locomotion, &c., just referred to. So great, however, are these disturbing influences, that they often produce an extraordinary external resemblance or pseudo-analogy between animals of a very different nature, as between a *Chiton* and an *Oniscus*, and they are connected intimately with, though not the cause of, what we call specific or generic distinctions. Aërial life, in contradistinction to aquatic, raises much the character of the locomotive organs; yet this is subordinate to type: hence the creeping Mollusk appears to have commonly a higher organization than the flying Insect.

The cartilages of *Sepia* have a true resemblance to those of a Skate, and the Cirrhipede truly connects the Mollusk with the Crustacean. The author regards *Dentalium* as a gasteropod, differing in this respect from Lacaze-Duthiers, whose beautiful paper, however, renders it supererogatory to say anything more on this animal, except that the author believes that the presence of the spiniferous tongue, of a proboscis, and the nature of the food, are favourable to his view: he also takes the feathery tufts to be the branchiæ.

The anatomy of *Aspergillum* is similar to that of *Pholas*; its mantle, however, is all but closed in front, and ends in an obliquely-set muscular disk, applied to the internal surface of the rose of the so-called *arrosoir*, the openings of this part of the shell giving exit to certain processes and fimbriæ of the fleshy disk,—a narrow slit being also left in both the muscular and shelly disks for the exertion of the small, compressed and curved foot. The

animal is enveloped within the shell by a rather horny, general membrane.

The author touches upon the anatomy of some other genera of Lamellibranchiata. *Solemya* has its firm, horny, dark cuticle doubled inwards from the valves over the tubular mantle; behind, it has an anal opening, and a second fringed branchial slit lower down: the branchiæ and tentacles are single on each side, the former being remarkably feather-like. The foot is similar to that of the *Solens*, but crenate round its anterior disk. *Cyrenoidea* has the mantle closed below, but with two openings behind, the upper one with a semicircular internal fringe, incomplete above; a callous rim and fringe surround the mantle, which has also a third opening for the long, compressed, bent, and blunt foot. This last has a remarkable crystalline body, directed from the stomach to the pedal pore, apparently, as in *Cardium*, subserving by its elasticity to the extension of the foot, and consequently to locomotion; at any rate, it is not a sexual distinction. The external branchiæ are short, and the upper or internal branchial cavity does not communicate with the lower one. The renal organ opens near the branchial nerve, and the ovary at the base of the abdominal mass. *Trigonia* is remarkable for its beautifully fringed, open mantle, its pectinated pits for the secretion of the teeth, and the large scythe-shaped foot, trenchant before and peaked behind, and having a fringed disk. *Vulsella* is allied to the Oyster, but more so to the Pectens, having a small cylindrical grooved foot and appended visceral mass, but no byssus; the rectum perforates the heart, and has a tentacle above its opening. *Perna* has a similar foot, and a very bulky byssus, with a large muscle attached to their base; the lips resemble those of the Oyster. The anatomy of *Crania* is little different from that of *Orbicula*, as described by Owen,—the beautiful arms folded in several coils, with a simple mouth at their base, the stomach and short intestinal canal surrounded by the liver and hearts, and terminating by a lateral bend; the ovaries ramifying in the mantle; the adductor muscles being four in number, with some bands to the mantle; and on the latter, glandular markings corresponding with the microscopic sculpture of the shell. With respect to *Anomia*, the author has again been anticipated by Lacaze-Duthiers, though he has already given, in another paper, most of its anatomy and morphology: he would simply call attention to its very long and curious crystalline stilette, unconnected with the minute foot.

With respect to that *questio vexata*, the sexes of the Lamelli-

branchiata, he observes that any number of individuals of *Cyclas* may be examined, and young fry will be found in the branchial laminae in all; that all Oysters have ova, and also all individuals of *Pecten maximus*, the subpedal mass being visibly composed of an ovary and a testis. He is obliged to believe that one species of British *Anodon* is universally oviferous. But the common Edible Cockle appears to have the individuals of different sexes, and the same may be said with regard to *Mytilus edulis* and *Patella*.

The spermatozoa in the Cockle are oblong and a little curved, and torulated, as it were, whilst they are pear-shaped in *Mytilus*; they are also extremely minute, and their appendages must be very fine, for with a power magnifying 500 diameters they are scarcely to be seen.

In the shell of a *Patella*, *Emarginula*, or *Haliotis*, we have the two conjoined valves of a lamellibranchiate mollusk; and through such forms as *Calyptræa*, *Hipponyx*, *Navicella*, and *Nerita*, we arrive at the ordinary form of the gasteropod with its operculum.

Then follows a disquisition on the progressive tendency to a spiral geometry in these animals, due to a varying plan of conformation, and not to the force of the heart, there being generally an atrophy of the left side of the body. In *Nautilus* and *Argonauta*, the shell and mantle are reversed in position to what they are in the Gasteropods, whilst *Sepia* and *Hyalæa* agree rather with the latter. The symmetrical shell of the lower Gasteropods undergoes a lateral torsion in the higher, spiral forms, to become again symmetrical in the Cephalopoda. The branchiæ in *Patella* retain a position analogous to that of the same organs in the Lamellibranchiata; in some Chitons they have a tendency to retract towards the anus, as in *Doris*; in *Fissurella* they waste at the sides and become developed above the neck, as in the spiral Gasteropods; but in them, the right branchia, and right side of the mantle are principally developed. From this torsion arises the form and spire of the shell. In *Aplysia*, where the branchial fissure is far back and to the right side, the right respiratory nerve preserves a superior position, and passes backwards to form its ganglion at the front of the branchial opening; the left, on the contrary, passes under the œsophagus to form a second ganglion, not mentioned by Cuvier, behind the first. In the more spiral Gasteropod the torsion is greater; the right nerve, for instance, mounts upwards over the digestive canal to form its ganglion quite in the left flank, whilst the left goes below the digestive

canal to attain the right flank. In *Sepia* the branchiæ are again symmetrical and abdominal.

The shell of the young *Sepia* is composed of distant plates, only connected by minute transversely striated laminae or flattened tubes, producing by their insertion a beautiful appearance of sinuous lines, very like those of a Baculite or Ammonite; and the spongy part of the shell, so constituted, is probably filled with air from the cavity of the body situated immediately in front, the intervening membrane having a peculiar structure. This cavity of the body exists in much lower mollusks; air being apparently secreted in it, to lighten the animal.

The author thinks that, in considering the anatomy and form of the body of the Gasteropoda, about ten species may be taken as types of corresponding families.

1. *PATELLA and its congeners*.—He claims to have been one of the first to show the termination of the oviducts and renal organs between the processes of the branchiæ in the Chitons. As they are commonly phytivorous, the intestine is often very long and disposed in large coils, in double apposition; the buccal apparatus is very remarkable. *Chitonellus* differs but slightly from *Chiton*, the central elements of its tongue, however, being little developed, though having the same tessellated basement membrane. The tongue of *Emarginula* differs much from that of *Patella*, having an immense number of serrated side-hooks and a dilated middle portion.

2. *CALYPTRÆA, &c.*—The mollusks of this division have often supranuchal branchiæ, as have some of the last; the sexes also are frequently separate, rendering copulation necessary; and they are sometimes partially spiral, with a tendency to form an operculum. However, the little *Ancylus fluviatilis* appears to be what is commonly called hermaphrodite, with a branchial lamina on the left side, together with the heart and openings of the genital organs; the stomach has a cæcum, and the penis a long filiform appendage; the female parts opening near the rectum and behind the male organs. It must respire by water rather than by air, for, in a rapid stream, the stones at the bottom are covered with *Ancyli* (upon which also its round oothecæ, each containing four or five ova, are deposited), and it appears impossible for them to get to the surface to breathe. On the contrary, the lake-*Ancylus*, though the margin of its mantle is ciliated, may perhaps come to the surface, ascending the stalks of the Water Persicaria, on which it is mostly found, and on which its oothecæ are deposited. When the dark cuticle of this last minute creature is removed,

its organs may be seen to be reversely disposed to those of the larger species, the heart being placed to the right, before the apex of the shell, and the rectum also on the same side.

3. *DORIS*, &c.—The little *Doris aspera* swims, back downwards, on the surface of a glass of sea-water, copulates, and deposits its semicircular oothecæ. The brain of the common Lemon Doris is of a fine orange colour, enveloped in a glandular matter, and is constituted by a complicated assemblage of ganglia: there are acoustic sacs and dark ocular spots upon it. There are six ganglia on the buccal mass, and about six or eight minute ones on the stomach. The anal sac appears to be a purple- or ink-bag; and the so-called matrix is composed of a peculiar substance, swelling enormously in water, of which it renders a large quantity viscid, and being also coagulable by alcohol and bichloride of mercury, but not by heat. Spermatozoa were found in the genital vesicle, as well as in the epididymis and its cæcum. The spines of the lingual plate are uniform, and in number about 10,000.

4. *APLYSIA*, &c.—*Aplysia* has been before alluded to. Cuvier, in his generally beautiful drawings, has scarcely done justice to (5) *Ianthina*, nor to its beautiful float and ootheca; it is peculiar for its fins, and the disk at the back of the foot. With respect to *Magilus*, it should be removed from the (6) Tubuli-branchiata, its animal being a *Purpura* in structure, with a bent horny operculum, and a very long linear appendage on the right side of the head, leading to the supposition that the animals are of different sexes, though there seem to be difficulties in the way of sexual congress. In the specimen examined, the spire of the shell was not solidified; the animal had a short proboscis, with rather bent subulate feelers, and eyes on the outside; it had also a rich purple secretion near the rectum on the right side.

7. *TROCHUS*, &c.—Some of the species of *Trochus* surpass even *Emarginula* in the beauty of their lingual apparatus. The renal organ opens into the bottom of the branchial cavity, contrary to its disposition in *Helix* and *Lymnaeus*, where its exit is near the respiratory orifice. In *Planorbis*, that part of the respiratory cavity receiving the excretions seems separated by an imperfect valve from the right portion. With respect to the secretion of this organ, it consists, in both Gasteropoda and Lamellibranchiata, of numerous pellucid globular bodies, containing opaque earthy nuclei or granules, and presenting different appearances in *Anodon* (for instance), *Cyclostoma*, *Buccinum*, and *Helix*. When these bodies are incinerated, lime is left, which in some cases appears to have been combined with oxalic acid. The little *Nerita litoralis* presents

the structure of the Turbonidæ very prettily and in small compass, particularly in the very long spiral tongue. *Delphinula* has the fringed mantle and sides and very wonderfully armed tongue of the other Trochidæ. *Melania* is of similar organization to our well-known *Paludina*, the stomach compound, the mantle and bilobed head fringed, and the latter marbled like that of *Paludina*. *Ampullaria* appears to be truly amphibious.

8. *BUCCINUM*, &c.—*Natica* presents much the same structure as the common *Buccinum*, but has a muscular disk anterior to the mouth,—a disposition, with some variations however, found in other mollusks. The first and second stomachs are at a distance from each other, the tongue is little developed, and the branchiæ (often single in the Turbonidæ) two in number. *Purpura* also differs but little from *Buccinum*. *Ovula* is a less attainable mollusk: the foot is long and rather narrow, and subventral rather than subtrachelian, with a sinuosity on the right of the neck, where also is a short hooked penis in the male, receiving a vas deferens from near the rectum behind; there is a large and small branchia, and the reflected portion of the mantle is covered with tubercles and tentacles,—no doubt a fine garnish in the living animal; the mouth has a muzzle, and there are small eyes on the external sides of the curved, awl-shaped tentacles; the elements of the tongue are beautifully toothed and serrated.

9. *LYMNÆUS*, &c.—Of the air-breathing aquatic and (10) terrestrial gasteropods the most interesting particulars are their generative organs, which the author proposes to re-examine. The brain of *Helix aspersa* is composed internally of pyriform or oval ganglionic vesicles, each giving origin to one or more nervous fibres. The acoustic sacs are similar to those of *Doris*. The nerves from the upper part of the ring are enveloped in a darkish neurilemma, and comprehend no doubt olfactory, optic, and tactile twigs; there being the buccal ganglia for taste, and the acoustic sacs for hearing; the twigs, however, forming the buccal or pharyngeal ganglia have a broad double root on each side, near the origin of the above three nerves. The lower part of the brain is very analogous to that of *Sepia*, giving off nerves to the foot, and external and internal respiratory ones to the mantle, respiratory opening, branchiæ, &c. *Lymnæus* has the cephalic ring formed by about twelve ganglia, exclusive of two large and two minute ones on the buccal mass. The upper portion of the ring has ganglionic swellings, but in other respects the nerves are as in *Helix*. Its lower portion consists of two pedal nerves, and has the

acoustic spot and a minute ganglion upon it; behind, this lower portion consists of five ganglia connected with both the anterior and upper swellings by a cord, but separated from the former by the aorta, as usual, and giving nerves to the flanks, pulmonary orifices and sac, heart, stomach, and viscera. The lower ganglia are bright yellow.

With respect to the Pteropoda, the branchiæ in *Hyalæa* exist as a delicate membrane under the swollen part of the shell, in structure much like the same part in the Ascidians, the inlet being through the anterior opening of the mantle. There are eyes at the fold of the mantle behind, and two small tentacles above the mouth; the heart and rectum being on the left side, and the generative opening at the base of the right ala. *Cleodora* is a very beautiful creature, with the same disposition and structure of viscera; brain-spots but no eyes were visible; the mantle had beautiful muscular bands; the branchiæ as above; the buccal apparatus is imperfect in both. *Cleodora* has similar membranous expansions with *Hyalæa*, and also a sort of triangular lip.

Argonauta has a lachrymal pore before and beneath the eye. The beautiful and obvious respiratory mechanism in the Cephalopoda needs not to be described. There is a large sac behind the viscera of the Argonaut, which opens on each side; it is perhaps of some hydrostatic use. There are at least three pairs of salivary glands, of which four open on the floor of the mouth, and two or three at the commencement of the gullet. Several small shells of Pteropoda and fragments of Cephalopods were found in the stomach, on which was observed the large nervous ganglion found in all these, as well as in lower mollusks. The branchial nerves have each two ganglia, of which the last at the root of the branchiæ is rounder than the other; the branchial hearts have processes as in *Sepia*. In *Sepia* two openings lead from the respiratory sac into the cavity containing the venæ cavæ and their secreting appendages often imbued with glittering crystalline particles, and from the above cavities a wider opening on each side leads into a second sac further back, situated in front of the shell. There are auditory sacs in the Argonaut. The oviducts have separate openings, but originate together. Both *Sepia* and *Argonauta* are infested with a subcutaneous filiform entozoon, hooked anteriorly and rolled up spirally in the former. *Loligo media* and *Sepiola* have but one oviduct, and the two large, glandular, laminated organs, opening at their summits, are wanting in *Argonauta* and *Octopus*. In *Sepiola* one would almost think that copulation takes place, for the

author has taken what he supposes to be the capsules of Needham, with dilated oval ends, tubular and bent pedicles or processes, enclosed elastic filaments, and adhering zoosperms, from the oviducts of the female: he has made the same observation also in *Sepia*. The latter has very similar male organs to *Octopus*, as described by Cuvier. In the embryo *Sepia*, the yelk enters below the mouth and opens into the upper stomach, but the beak of the animal also appears to be inserted into it behind. The vitellus in reality therefore enters by the foot, as it does in *Bulinus*, and probably in all Bivalves.

On the Linnean Manuscript of the 'Museum Ulricæ.'

By SYLVANUS HANLEY, Esq., F.L.S.

[Read Dec. 3, 1858.]

NOR the least important result of the investigations of the Committee appointed by the Linnean Society to examine the condition of the collections and manuscripts of Linnæus, was the rediscovery of a written copy of the 'Museum Ulricæ.' The volume was manifestly, from internal evidence, a legible transcript of the original manuscript of that work, with alterations and interpolations in the peculiar handwriting of the author. It was, indubitably, the unpublished catalogue so often mentioned in the tenth edition of the 'Systema,' and contains descriptions of certain species alluded to as defined, yet, strangely enough, omitted in the printed edition. It is worthy of notice for many reasons: it corrects the frequent misprints; explains the many fallacious allusions to preceding species, their sequence being very different; it exhibits those early synonyms, which, culled from comparison with the actually described specimens, had been eventually supplanted by supposed better representations; above all, it imparts to us those original headings, or diagnoses (condensed from the subsequent details), which had been suppressed, of old, in favour of those already published in the 'Systema.'

This wholesale substitution, adopted by Linnæus, as a ready method of avoiding a tedious revision of all the headings, when he absorbed in the more comprehensive groups of his 'Systema' the members of manuscript genera he had determined to reject, involved a serious amount of confusion; for, oftentimes, the species of the two works, although designated by the same appellations, were totally distinct; and the combination of the diagnosis of the one with the details of the other displayed an array of features not known to be associated in any object in nature.

The generic arrangement exhibited in the manuscript differs essentially from that which appeared in the final edition of his 'Systema Naturæ.' As a whole, it is decidedly inferior, yet it segregates certain natural groups, such as *Lyra* and *Cassida*, the value of which have been acknowledged by all modern naturalists. The following list and sequence of the genera comprised in it, cannot, indeed, be regarded as an entire system, for certain groups, viz., *Chiton*, *Lepas*, *Teredo*, *Sabella*, and the typical forms of *Mya*, *Mactra*, and *Anomia*, were not at that period represented in the Museum; but it is not devoid of interest, since it manifests a transitional stage in the progressive advance to that matured scheme which was finally elaborated in the pages of his revised 'Systema.'

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|--|--|
| Dentalium. | Haliotis. |
| Patella. | Nautilus. |
| Nerita. | Cymbium (= Argonauta). |
| Helix. | Spondylus. |
| Turbo. | Ostrea. |
| Trochus. | Pecten. |
| Turricula. | Arca. |
| Buccinum. | Pinna. |
| Lyra. | Mytilus. |
| Morion. | Solen. |
| Conus. | Tellina. |
| Voluta. | Chama (not that of the 'Systema'). |
| Strombus (not that of the 'Systema'). | Cunus (= Venus). |
| Harpago (= Strombus). | Pholas (not that of the 'Systema'). |
| Murex. | Trunculus (= Donax). |
| Cassida. | Bucardium (= Cardium). |
| Cypræa. | |
| Bulla. | |

Besides the four genera (*Chiton*, *Lepas*, *Teredo*, *Sabella*) that were excluded from this catalogue, either from the absence of specimens, or from mistrust of their being veritable Testacea, six of the remaining 32, namely, *Pholas*, *Mya*, *Mactra*, *Chama*, *Anomia*, and *Serpula*, were likewise omitted, not being yet eliminated from *Solen*, *Bucardium*, *Spondylus*, *Ostrea*, and *Dentalium*. To counterbalance these, we find no less than eight subsequently abandoned groupings:

Turricula (an undefined amalgam of the long-spined species of *Buccinum*, *Murex*, and *Strombus*).

Lyra (the *Harpa* and *Purpura* of the Lamarckian school).

Morion (an unnatural compound of *Eburna*, *Auricula* proper, *Pythia*, &c.).

Strombus (a combination of the immature members of the received genus with *Pyrula*, *Fasciolaria*, and other allied forms).

Cassida (nearly the modern *Cassis*).

Pecten (equal to *Lima* and *Pecten*).

Chama (the *Tapes* of recent conchologists).

Pholas (chiefly composed of *Artemis* and *Lucina*).

It may be remarked, moreover, that the simple univalves commence, and the bivalves close the series; the exact converse of the order in which they are marshalled in the two principal editions of the 'Systema Naturæ.'

I feel assured, after a careful study of the manuscript, that the names eventually allotted to the shells of the 'Museum' did not result from a careful comparison of the royal specimens with the typical examples in the private collection of our author, but were attached to the species, either from the identity of the written and printed synonymy, or from the general accordance of their described features with the meagre characteristics enumerated in the prior publication.

The erased nomenclature of the species, however, was very dissimilar, and was scrupulously based upon a supposed identity of the specimens with those delineated by Rumphius, Klein, and d'Argenville. Assuredly at that period of his career, our author entertained the same profound respect for the laws of priority which is professed by all modern naturalists; and I hesitate not to affirm that, from the crude and inharmonious theories of his predecessors, he eliminated a system of Conchology that was better suited to the requirements of the age he lived in than any more elaborate arrangement would have been. For simplicity attracts the student, whom a more complex (even if more natural) method would repel; and for the collection of an adequate mass of materials wherewith, eventually, to build up a more symmetrical and widely-based structure, a multitude of comparatively unskilled labourers is more efficacious than a small knot of the most erudite architects.

Before inviting the attention of my readers to the original headings of the 'Museum Utricæ,' and to my brief account of the variations in the written copy from the text of the printed version, I must premise, that it has not been my practice invariably to notice, in the summary, such trifling differences of construction as the preferential use of the ablative for the nominative case, where the verbal change involved no alteration of the precise meaning.

MUSEUM LUDOVICÆ ULRICÆ REGINÆ.

CONCHYLIA.

CHITON. LEPAS.

Nothing relating to these two genera was found in the copy.

PHOLAS.

The *Pholas* of the manuscript is perfectly dissimilar to that of the 'Systema.' Our author had evidently, when he first wrote the 'Museum Utricæ,' not appreciated the remarkably striking characteristics of this group, having located the only species he then knew (for *P. candidus* seems a subsequent discovery) with the *Solens*.

P. CANDIDUS. Not mentioned in the manuscript.

P. CRISPATUS. *Sol. ovatus, obtusissimus, cardinis dente depresso rotundato.*

The Appendix to Lister was not cited; "Habitat in Anglia, Suecia," was appended to the description, which in many respects was inferior to the published one. The account of the hinge was merely "Cardo dente dilatato rotundato extus excavato."

MYA.

The three incongruous forms assorted as *Myæ* were not so united in the MS.; the second being very properly placed with the *Mussels*, the other two ascribed to *Solen*.

M. LUTRARIA. *Sol. ovali-oblongus, cardine laterali dilatato semiorbiculato.*

In lieu of the reference to Lister (whose work does not appear to have been consulted by our author at the period when this portion of his manuscript was written), plate 45, figure N, of Rumphius was quoted as illustrative. The published account of the hinge is much more complete than the written one, which was apparently drawn up from a worn specimen; it ran as follows: "Cardo extus vix gibbus, intus constans laminis 2 semi-orbiculatis concavis introrsum spectantibus."

By a slip of the pen, in my 'Ipsa Linnæi Conchylia,' I had termed Brown's figure of the Linnean *Mya lutraria*, *L. oblonga*, instead of *L. elliptica*.

M. PERNA. *Myt. lævis, cardine terminali unidentato.*

The intended name was *M. Magellanicus*.

M. VULSELLA. *Sol. oblongus, linguæformis, cardine terminali dilatato semiorbiculato.*

"Pinna linguæformis subfalcata" was written after the reference to the 'Museum Tessinianum;' hence it seems that Linnæus did not himself consider that he had used the binomial method in that work, or he would have quoted it as *P. lingulata*.

"Rumph. 148. t. 46. f. A," and "Gualt. t. 90. f. H," were the unpublished synonyms.

SOLEN.

Testa valvulis utrinque hiantibus. Cardo dente unico inflexo recurvo.

The *Mya lutraria*, *M. vulsella*, and *Pholas crispatus* were originally included in this genus.

S. VAGINA. *S. linearis rectus*, cardinibus unidentatis.

"Habitat in Indiæ littoribus arenosis : in mari Rubro (*Hasselquist*)" was the recorded locality in the MS., where the European shell delineated by Gualtieri was not then included : "Klein, 163. t. 11. f. 65" (a copy from the cited figure of Rumphius) was its substitute.

S. SILIQUA. *S. linearis rectus*, cardine altero bidentato.

The wretched drawings of Argenville were not quoted ; but "Bonan. 2. f. 56" (error for 57), "Planc. t. 3. f. 6," and "List. Ang. 192. t. 5. f. 37," were cited instead.

S. ENSIS. *S. linearis subarcuatus*, cardine altero bidentato.

The final remark was not in the MS.

S. CULTELLUS. *S. ovali-oblongus curvatus*.

"Habitat in Amboinæ littoribus arenosis" is an addition of the MS. The intended name (derived from Rumphius) was *cultriformis*,

S. RADIATUS. *S. ovalis*, cardinis costa tereti.

"Habitat in littoribus arenosis Xulii (?) Amboinæ" is an addition to the published account. The intended specific name was *violaceus*, an appellation bestowed upon it by Rumphius : "*solida*" was an emendation.

S. STRIGILATUS. *S. ovalis*, oblique striatus.

"Bonan. 2. f. 76" (error for 77) was an unpublished synonym.

S. ANATINUS. *S. ovatus membranaceus*, costa falcata.

Rostrum anatis was the intended name.

TELLINA.

Testa altero latere inflexa. Cardo dentibus aliquot, raro lateralibus.

T. GARGADIA. *T. antice rugosa*, rima dentata.

The absurd "marginis posticum latus remotum" was a misprint for (dens) "marginis posticus, latus, remotus."

T. LINGUA-FELIS. *T. subovata scabra*.

"Klein, t. 11. f. 62" (cited in the 'Systema'), and "d'Arg. t. 25. f. G" (the description of which suits better than the drawing) are the additions of the MS. : "sesquialtore" was the printed emendation of "latiore."

T. VIRGATA. *T. ovata*, striis transversis retrorsum imbricatis, dentibus lateralibus.

The erroneous reference to d'Argenville was not present : "Klein, 158. Tellina virgata Rumphii" had been added by Linnæus. A very large portion of the printed account is wanting in the MS., to wit—"æquales. Intus radiis obsolete incarnatis picta." "Labris rugosis et scabris," "hymene tectis. Anus est rima concava," "primores," "transversi cum cavitate pro oppositis dentibus," "longitudinalem." The "retrorsum" was originally "sursum"; "dextrum" was "sinistram"; "Tertius dens" was "Alterna testa."

T. GARI. *T. ovalis*, striis transversis retrorsum imbricatis, dentibus lateralibus nullis.

The *G* in the reference to Rumphius, and the *F* in the reference to d'Argenville were misprints for *D* and *I*, and were so published in the 'Systema': the "primoribus" was an emendation.

T. ALBIDA. *T. ovalis*, lævis, nymphis prominulis. "Primores" was an emendation. The species was unnamed.

T. FOLIACEA. *T. antice scabra*, rima serrata.

The Rumphian name "folium" was the intended appellation: "Klein, 162. t. 11. f. 64" was cited, as in the 'Systema': "aciatum" was the reading for the printed "acutum."

T. PLANATA. *T. ovata plana*, transversim striata, marginibus acutis.

The erroneous reference to Gualtieri (whose figure *C* looks more like the species than his *G*) is not to be found in the manuscript. The species was not named.

T. LÆVIGATA. *T. ovata lævis*, nymphis intractis.

The figure of *T. chloroleuca* in Rumphius was not quoted, neither was the hence-derived appellation attached: the "radiato" and "primoribus" were also subsequent additions.

T. RADIATA. *T. ovali-oblonga*, longitudinaliter substriata, sutura postica canaliculata. "Obsoletis" and "primores" were subsequent emendations.

T. ROSTRATA. *T. oblonga*, antice angulato-rostrata.

The *T. rostrata* of the final edition of the 'Systema' was assuredly the *T. Spengleri*, and with that shell solely will the printed account in the 'Museum Ulricæ' accord. But the five earlier lines of the description (save "et albus"), and the detailed dentition (except "fossula distinctus"), with the varieties *a*, *b*, *g*, and the same synonyms as in the tenth edition of the 'Systema,' appear in the MS. with the name *T. petasunculus* attached. Whether designedly or not, there was a pictorial definition of *T. vulsella* in the earlier 'Systema;' and if an author be not allowed to amend his description, *T. vulsella* is better entitled than *T. Spengleri* to the name *rostrata*. "Margo exterior parum repandum est" was written in the MS.

T. REMIES. *T. rugosa*, suborbiculata.

The expressions "hians," "primores," "remoti," and the last five words of the details were absent; "utrinque" followed "duo": "non" in place of "vix" was the earlier reading.

T. SCOBINATA. *T. scabra orbiculata*.

"Primores," and "in altera testa profunda fossula distinctus," were not in the copy.

CARDIUM.

Cardo dentibus baseos binis, marginis solitariis remotis acutis. Valvulæ gibbæ, hinc figura cordis.

BUCARDIUM was the epithet applied in the written copy to the members of this genus, to which the *Solen bullatus* of the 'Systema' was correctly referred. *Mactra* had not then been separated.

C. COSTATUM. *Buc. sulcis costis elevatis membranaceis.*

The original description has been somewhat enlarged in the press, by the addition of "brevissimis," "et extrorsum flexis," "fossula distinctus; at vero ille sub ano quasi duplex": "minus vero ad latera sulcata," moreover, was simply "ad alterum latus": the only expression omitted in printing was "reflexus," which followed "Anus margine."

C. CARDISSA. *Buc. compressum, valvis carinatis, natibus contiguis.*

"Colum. Aqu. 19. t. 16" (cited also in the 'Systema') was quoted in the MS. from which the "vix," "subcontigui," "remotus, validus, fossula distinctus," were absent. The "Rima" was termed "subrotunda" instead of "cordata."

C. HEMICARDIUM. *Buc. subquadrilaterum: valvulis carinatis, umbonibus distantibus.*

"Fasciis" was a misprint for the original "facies": "sulcis convexis" was written "sulcis excavato-rugosis." There was no specific appellation.

C. MEDIUM. *Buc. subcordatum subangulatum; valvulis angulatis sulcatis lævibus.*

The prefatory remarks were the only portion of the printed description to be found in the MS. The species was not named, but was quoted in the 'Systema' before the publication of its details.

C. ACULEATUM (misprinted "muricatum"). *Buc. subcordatum, sulcis convexis, linea cava exaratis, versus apicem dentatis.*

The intended name was *verum*.

C. ECHINATUM. *Buc. subcordatum, sulcis acutis exaratis linea elevata ciliata aculeis inflexis plurimis.*

"List. Ang. 188. t. 5. f. 33, Pectunculus echinatus," "Bonan. 2. t. 90," "Gesn. Aq. 131, 132," "Faun. Suec. 1339," "Rondel. Aq. 22," were the original synonyms, to which our author had subsequently added "Klein, 139. t. 10. f. 40." "Alba" followed "gibba"; "parum antrorsum inflexis" was the reading for the printed "erectis subulatis"; "extrorsum" for the "uti extus": "brevioribus. Anus lævis, sutura simplici prominula," "recurvi," "fossula distinctus," were emendations.

C. TUBERCULATUM. *Buc. subcordatum, sulcis obtusis nodosis transversim striatis.*

"Gualt. t. 71. f. m." was a correct additional synonym.

C. ISOCARDIA. *Buc. cordatum, sulcis imbricatis squamis fornicatis.*

"Klein, 138. isocardia fragum" had been interpolated by Linnæus; hence the name, which was not in the original. The "fossula distincti" has replaced the earlier "validi."

C. FRAGUM. *Buc. subcordatum subangulatum, sulcis notatis semicirculis elevatis.*

By the addition of "mala" to the erroneously cited figure of Gualtieri, our author has virtually repudiated it. "Spinosa" followed "Pruni;" the fallacious "s. rubris" was not present, nor "sæpe" either; "antere" stood in the place of "postico," and "postico" in that of "antico." The

descriptions of the "rima" and "anus" have been added: "recurvati" and "fossula distincti" were amplifications.

C. UNEDO. *Buc. subcordatum, sulcis lunulis coloratis.*

C. MURICATUM. *Buc. subrotundum sulcatum, lateribus muricatis.*

C. MAGNUM. *Buc. oblongum, sulcis angulatis latere serratis.*

I had hoped to have found the 19 a misprint, but the MS. and the printed copy agree precisely in every particular.

C. FLAVUM. *Buc. subovatum sulcatum, latere altero scabrum, altero dentatum.*

The redundant "subovata" was not in the copy, where the remark was made that the species resembled the shell subsequently termed *Chama cor*, the figure of which (Gualt. t. 71. f. E.) had been cited, but erased in the MS. The ideal hence derived is a very different shell from the one supposed identical. No mention is made of lateral teeth: was it then a veritable *Cardium*?

C. LÆVIGATUM. *Buc. ovatum, striis læviusculis longitudinalibus.*

I do not consider this (the *B. striatum* of the MS.) to be identical with the *C. lævigatum* of the 'Systema.'

C. SERRATUM. *Buc. ovale læve, antice serratum.*

"Ovata" stood in the place of the printed "obovata": "curvatus" and "parvi" were subsequent to the MS.

C. TRISTE. *Buc. ovatum læve, rima anoque obsolete striatis.*

The 'Museum' was referred to for this shell previously to the publication of the details. Curious to relate, the species was wholly omitted in the twelfth edition of the 'Systema.' It was, in all probability, a *Mactra*, which genus had not been constituted at the period when the description of *C. triste* was issued.

C. PECTINATUM. *Buc. subcordatum, striis hinc longitudinalibus, illinc transversalibus.*

The erroneous reference to Gualtieri was not present in the written copy.

Mention was made in the 'Systema' of a *Solen bullatus*, for a more detailed account of which the reader was referred to the 'Museum Ulricæ.' No such species appeared in the published edition; but the omitted shell (a veritable *Cardium*) was thus described in the unprinted version:—

BUC. BULLATUM. *B. subrotundum, antice crenato-hians.*

Rump. 143. t. 44. f. N. *Pecten bullatus.*

Testa subrotunda, inflata, gibba, fragilis, pellucida, substriata, rufo nebulosa, antice hians, margine serrato. Umbones tumidi, obtusi, reflexi. Rima minima brevissima. Ani regio obsoleta. Dens cardinis fere unicus, minimus. Marginales solitarii, remoti, compressi, majores.

DONAX.

TRUNCULUS was the proposed name of this genus, which was thus characterized:—

Testa compressa, antice obtusissima, retusa. Cardinis dentibus 2, marginis unicus.

D. SCORTUM was wisely omitted.

D. PUBESCENS. *Trun.* antice spinis ciliatus.

D. RUGOSA. *Trun.* antice rugosus, marginibus crenatis.

The printed "cuneiformis" has replaced the earlier "majuscula"; and "crenulatis" was originally "undulatis." "Intus subviolacea est" was not in the written copy.

D. TRUNCULUS. *Trun.* antice lævis, marginibus crenatis.

The reference to Klein was not in the original, but "d'Arg. t. 25. f. L." was quoted (as in the twelfth edition of the 'Systema'). The last seven words printed were not in the copy. The intended name was *gibbus*.

D. CUNEATA. *Trun.* cuneiformis, marginibus integerrimis.

The final remark was not in the copy, where "parva, ovata," preceded "cuneiformis." The then unpublished details were quoted in the 'Systema.'

D. SCRIPTA. *Trun.* ovatus lævis scriptus.

The erroneous citation of Gualtieri (a misprint for 88. f. Q.) was not in the copy, and, as the figure represents the *D. trunculus* in the page opposite, I suspect was carelessly placed here by the printer, when our author had inserted it in his revised proof. I suspect this error often occurred, as for instance in *Tellina planata* and *radiata*, where Gualtieri's figure (added during revision) was attached to the former instead of to the latter. "Margo interne crenulatus," and nearly the entire account of the teeth, were emendations.

D. MURICATA. *Trun.* ovatus, striis muricatis, margine denticulato.

"Postice solitarii" followed the final "utrinque": "primores" was an emendation.

VENUS.

This genus (as a whole) was not to be found in the manuscript System. Its components were distributed into three groups, two of which bore names that were subsequently allotted to forms very remote from those therein so designated.

CUNNUS. Testa subrotunda. Rima nymphis instructa. Dentes cardinis 4, lateralibus divaricatis versus latera. This contained the bulk of the *Veneres*, all except Nos. 63, 66, and those referred to *Pholas* and *Chama*.

PHOLAS. Testa lenticularis. Rima fissa, destituta nymphis. Dentes cardinis 1 s. 2, marginalis tantum intra anum. *V. Pennsylvanica*, *incrussata*, *punctata*, *edentula*, *exoleta*, *scripta*, *pectinata*, *ziczac* were its constituents.

CHAMA. Testa ovalis cum angulo. Cardo dentibus 4 confertis, quorum unus in singula valvula bifidus. In this were located *V. literata*, *rotundata*, *decussata*.

V DIONE. *Cun.* cordatus, antice pubescenti-spinosus.

The same references to Petiver, Olearius, and Lister were present as in the 'Systema.' The final remark was an addition. The proposed name was *C. Veneris*.

V. MARICA. *Cun. subcordatus, decussatim striatus, pube lamellosa.*

V. DYSERA. *Cun. testa subcordata, sulcis transversis reflexis, labiis concavis incumbenibus.*

Neither "*Huic rugæ, &c.*," "*lævis*," nor the synonym of Lister were in the original.

V. CHIONE. *Cun. subovatus, lævis.*

The erroneous reference to d'Argenville was not inserted in the MS., from which "*lanceolatis*," likewise, was absent.

V. MACULATA. *Cun. testa ovato-cordata lævis.*

"*Lanceolata*" and "*ovato-oblongus*" have been additions. The observation that it was difficult to distinguish this shell (which was not named in the MS.) from the following, would mislead one, since the remark referred to two unpublished species, which it originally preceded.

V. MERETRIX. *Cun. subcordatus glaber, labris gibbis, nymphis apice hiantibus.*

C. vulgatus was the name originally designed.

V. CASTRENSIS. *Cun. suborbiculatus glaber, characteribus scriptus.*

V. MEROE. *Cun. sutura postica hians.*

V. FIMBRIATA. *Cun. subrotundus decussatus rugosus, longitudinaliter striatus.*

D'Argenville was not referred to.

V. RETICULATA. *Cun. subcordatus, striis crenatis decussatis, ano cordato.*

V. TIGERINA. *Cun. suborbiculatus, striis crenatis decussatis, ano ovato.*

The name was an error, having been derived from the "*Lingua tigerina*" of Rumphius (his figure G., not II.): *fuliginosus* was the one originally intended.

V. PROSTRATA. *Pho. orbiculata, transverse striata, labiis scabro-membranaceis.*

The unpublished details had been previously referred to in the '*Systema*.'

V. PENNSYLVANICA. *Pho. glabra, rugosa, antice sulco longitudinali.*

"*Habitat in Pennsylvania*," and "*subdiaphana*," were the unprinted additions. The "*margo interne crenatus*," "*nates sub-recurvatæ*," and "*color intus versus marginem violaceus*," were not in the copy. The last character (so utterly inappropriate to the features of *Lucina P.*) was, I suspect, intended for *punctata* on the page opposite.

V. INCRUSTATA. *Pho. glaberrima lævissima, punctis excavata.*

The details were referred to in the '*Systema*' before their publication.

V. PUNCTATA. *Pho. longitudinaliter sulcata.*

The G in the reference to Rumphius was a misprint for the written D, from which figure ("*Chama pectinata*") our author had proposed to borrow the specific name, but subsequently had preferred the published designation. "*Klein, 147. Actinobolos æquilatera*" has been added to the MS. by Linnæus.

V. EXOLETA. *Pho. decussatim striata.*

The original synonymy and details have been so transmuted in the press, that it is manifest that the amended (!) species was perfectly distinct from the shell originally designed. The name of the latter was *clathrata*, and the declared sculpture was not merely "transversim," but "et longitudinaliter" likewise (in place of "striis retrorsis"). The reference (added by Linnæus) was not to Gualtieri, but to Lister, 335, f. 172, and its copy in Klein (t. 10. f. 52), both which would have more appropriately been assigned to *V. reticulata*. The *V. exoleta* having been previously defined in the 'Systema,' this confusion becomes of little importance.

V. ZICZAC. *Pho. striis transversis membranaceis erectis.*

The number which indicates the position of this species in the 'Museum' has been subsequently ('Syst.' ed. 12) referred to *V. cancellata*, yet, judging from the generic appellation (and consequent dentition), it could scarcely have been that well-known species. The "lentiformi" of the 'Systema' (ed. 10), where the name *ziczac* first appeared, forbids the annexation; but, although the details of the 'Museum' were there referred to, the obnoxious word was not mentioned in that publication. The following are the printed emendations (?): "lævis, et quasi excisa," "compressa," "variat colore albisimo."

V. PECTINATA. *Pho. sulcis longitudinalibus nodosis, antice antrorsum ramosa.*

The additional synonym of "Gualt. D. 75, f. A." appears in the MS., where "quam reliquæ" follows "orbiculata," and in place of "In area antica" may be read "et a primo sulco." The details there terminate with the word "lanceolatum." "*Ramosa*" was the intended name.

V. SCRIPTA. *Pho. striata, postice angulo recto circumscripta.*

The incorrect figure of d'Argenville was not indicated.

V. EDENTULA. *Pho. subgloboso-lenticulata rugosa edentula.*

V. LITERATA. *Cha. transversim striato-ovata.*

The earlier reading of confertim was "profunde"; "striis crenulatis antice et postice," "lanceolata," and "tres s." were absent.

V. ROTUNDATA. *Cha. transversim striata ovata absque angulo.*

The printed additions are "varius in variis," "aut albis," "lanceolata," and the final remark. There was no name attached in the MS.

V. DECUSSATA. *Cha. testa ovata, decussatim striata.*

"Sæpe" and "minimus" are the sole printed additions.

Probably the *V. Phryne* of the 'Systema' was designed by the following unpublished description:—

CUN. VENOSUS. *C. subcordatus lævis lateribus rugosis. Testa cinerea, nuce coryli major, gibba, glabra, antice et postice transversim sulcata. Margo exterius tantum denticulatus, non vero apex externus, aut margines laterales.*

The *V. macrodon* answers fairly enough to this definition.

SPONDYLUS.

This very natural genus was confused with *Chama*, and thus characterized :—

Testa imbricata. Cardo e callo gibbo oblique inserto fossula obliqua.

S. GÆDEROPUS. *S. imbricatus auritus, cardine dentato.*

"Rumph. t. 48. f. 1," "Gualt. t. 99. f. E. F. G," "Bonan. 2. f. 21," "Rondel. c. 40. p. 41," were the additional synonyms of the MS. The "ad cardinem truncata" was an emendation for the previous "breviore": the "superiore" a misprint for the written "inferiore": the final remark was not present.

S. REGIUS. *S. spinosus sulcatus inauritus, cardine dentato.*

No name was attached to this species: the previous one had been termed *Pectinites*.

S. PLICATUS. Not mentioned in the manuscript.

CHAMA.

The members of this genus were included in *Spondylus*, except *cordiformis*, which was referred to *BUCARDIUM*.

C. GIGAS. *Sp. plicatus squamosus, ano hiant e crenato.*

The species as originally defined was more comprehensive in its details than when printed; for the restricting "decussatim" had not been added, and "Gualt. t. 93. f. B." was an additional synonym. The printed additions were "obsoletis," "Margine reflexo," "exteriore duplicato longiore," and the final remark. *S. imbricatus* was the intended name.

C. HIPPOPUS. *Sp. plicatus muricatus, ano retuso clauso dentato.*

"Arg. t. 26. f. H." was an additional synonym of the MS.: the printed 20 should have been 10, as written: "ut in præcedente" was an emendation: *S. asper* was the proposed name.

C. LAZARUS. *Sp. imbricatus.*

Seba was not cited: "obliquam" followed "fossam" in the MS. "Elevatis," "longitudine testæ," "productiore," "instar auris," formed no portion of the early description.

C. ANTIQUATA. *Sp. subcordatus, sulcis perpendicularibus transversim striatis.*

No name was attached to the original details, which appear to have been altered ("in aliis minimum cordatum impressum fuscum"), and the synonym of Bonanni added, in order to comprise that species (*Cardita sulcata*) which had been pictorially defined in the 'Systema.' "Gibba" was preceded by "adnodum": "obsoletis" was not present. *Cardita bicolor*, var. *unicolor* was probably intended.

C. SEMIORBICULATA. *Sp. semiorbiculatus compressus, decussate striatus, rudis.*

"Interior" was the earlier reading of "primarius."

C. CORDATA. *Sp. cordatus, transversim striatus, hinc elongatus, compressus.*

C. OBLONGA. *Sp. oblongus, antice angulatus, dentibus anticis acutis.*
 "Unico" (error for "unicus") originally preceded "in altera valvula."

C. CORDIFORMIS. *Buc. subrotundum læve, umbonibus recurvatis.*

The brief description in the 'Systema' had evidently been copied in the manuscript by our author himself, who cited Gualt. t. 71. f. E. as the sole synonym. The specimen had apparently been added to the collection, subsequently to the drawing up of the first catalogue.

ARCA.

Testa crassa, umbonibus distantibus intus fornicatis. Cardo planus, masticatus dentibus numerosis minimis æqualibus transversis.

A. TORTUOSA. *A. oblonga obliqua, valvula altera oblique carinata.*

"Nates, &c." and "Cardo, &c." were the printed additions to the earlier description. The 'Systema' synonyms of Klein (t. 8. f. 16) and Bonanni (2. f. 128) were present in the manuscript.

A. NOÆ. *A. oblonga angulata hians.*

This manuscript furnishes us with the additional synonyms of

"Aldrov. 3. p. 513." and "Sloan. Hist. 2. p. 257. *Musculus Matthioli*," besides the previously published references to Lister (368. n. 208) and Bonanni (2. t. 32). The formation of the hinge was not, however, indicated, and the passage commencing with "Nates" has been enlarged from "*Umbones remotissimæ, area interjecta concava, ad angulum rectum striata. Margo exterior in medio hians, apertura barbata.*"

The intended specific epithet was *A. Noemi*.

A. ANTIQUATA. *A. testa oblique cordata, transversim sulcata, antice angulo compresso, rima intra rhombum transversim striata.*

The admixture of two species (at the least) in the published edition resulted from the amalgamation of two earlier descriptions. To the above diagnosis belonged the printed details with the following important changes. In place of "*extus striata longitudinaliter sulcis crenatis*," the reading was simply "*intus striata longitudinaliter*," and in lieu of "*interjecto spatio rhombeo plano*," merely "*rima patens*."

The proposed name for this shell, from a supposition of its identity with the *Pecten virgineus* of Rumphius, was *A. virginea*. The other species which Linnæus referred to the same numerals of the 'Systema' was not named, but was thus characterized:—

A. (Sys. n. 144). *A. cordata, sulcis nodosis, rima decussatim striata.*

List. Hist. *Peeten polyleptoginglymus, &c.*

Gualt. t. 87. f. C.

Testa reliquis magis gibba, albido-flavescens, sulcis xxx obtusis, transversim nodosis: nodis transversis, obtusissimis, imbricatis. Intus albida. Margo dentibus xxx argutiusculis. Rima sulco rhombeo circumscripta, disco decussatim vix manifeste striato. Umbones distantes ad neutrum latus flexi.

A. SENILIS. *A. oblique cordata, octosulcata, lævis, antice hians, rima obtusangule striata.*

Lister (without numerals!) was referred to in illustration; the early unimproved account of the beaks and ligamental area ran as follows: "Umbones distantes, oblique incurvati. Rima hians striata transversim ad angulos acutos": "et profunde immersis" was an addition.

A. GRANOSA. *A. subcordata, sulcis muricatis, rima obtusangule striata, utrinque angulum formante.*

The name was evidently borrowed from Rumphius, whose *Pecten granosus* ("143. t. 44. f. K.") was referred to in the manuscript, though neither quoted in the printed copy nor in the 'Systema' (ed. x.). "Bonan. 2. n. 73," and Lister (without numerals) were also cited.

A. DECUSSATA. *A. lenticularis, decussatim substriata, apicibus reflexis.*

For a detailed account of this shell, to which no specific name was attached in the MS., the 'Museum Ulricæ' was referred to, previous to its publication.

A. PALLENS. *A. lenticulari-subobliqua, decussatim striata, rima brevi.* This was the type referred to in the 'Systema.'

A. PECTUNCULUS. *A. lenticularis sulcata, decussatim rugosa.*

"Arg. t. 27. f. B," and Lister without numerals appended, were the unpublished synonyms. The expressions "leviter," "exteriore tenui; sulcata," "in arcum," were not parts of the original copy, which contained, however, the unprinted paragraph "latere interiore margine prominente notato." There was no specific name attached to either this or the next species.

A. GLYCIMERIS. *A. lentiformis, transversim substriata, rima lævi.*

The '*Chama glycimeris Bellonii*' of Lister (t. 247) was an unprinted synonym.

The following suppressed description of an unnamed Ark that was allied to, if it were not, *fusca* or *barbata*, was found in the manuscript. The 'Museum' had been referred to in the synonymy of the latter in the 'Systema,' but the species was not mentioned in the published version.

Arca ovalis, compressiuscula, apicibus subcontiguus.

Testa rudis, ferrugineo-fusca, longitudinaliter striata, striis quasi ex punctis callosis concatenatis, alternis striis majoribus ovatis, parum obliqua, minus lateribus gibba, rotunda absque angulis. Margo æqualis, edentulus. Apices recurvi fere tangunt se invicem. Rima dentibus minutissimis, antice longius extensa, nec recta.

OSTREA.

The very natural genus *Pecten* was separated from the unsymmetrical oysters, with the following definition:—

PECTEN. Testa subrotunda, altera planior, basis transversa, anguli transversi (auriculæ) ad basin. Cardo cavitas conica, striis utrinque 3 longitudinalibus obliquis.

The genus OSTREUM, enlarged by the addition of the true oysters confounded with the *Mytili*, the *Meleagrinae*, *Aviculæ*, and the *Anomia placenta*, was thus characterized:—

O. MAXIMA. *Pec. radiis 14 rotundatis longitudinaliter striatis.*

In place of Gualtieri, "List. Ang. 184. t. 5. f. 29. *Pecten maximus*," and "Faun. Suec. 1343" were referred to: these synonyms had been added subsequently to the description.

O. JACOBÆA. *Pec. radiis 14 angulatis, fornicis longitudinaliter striatis.*

The cited drawing of Gualtieri was not mentioned.

O. ZICZAC. *Pec. radiis 18 explanatis.*

No specific name was attached to this, the preceding, and the next two species.

O. STRIATULA. *Pec. radiis 16 oblitteratis, transverse membranaceo-striatis, margine integerrimo.*

O. MINUTA. *Pec. radiis 20 convexis.*

O. PLEURONECTES. *Pec. radiis 12 duplicatis, extus lævis.*

O. OBLITTERATA. *Pec. radiis 24 duplicatis, extus lævis.*

O. RADULA. *Pec. radiis 6 convexis decussate striatis, margine crenato, auriculis æqualibus.*

O. PLICA. *Pec. radiis 16 convexis læviusculis, decussato-striatus.*

No specific name was appended to either this, the next, or the two preceding species.

O. PALLIUM. *Pec. radiis 12 convexis, striatus, scaber, squamis imbricatus.*

This with the remainder of the *Pectens* (as far as *flavicans*) formed a group characterized by "Auricula altera intus ciliato-spinosa."

O. NODOSA. *Pec. radiis 9 nodoso-vesicularibus.*

O. PES-FELIS. *Pec. radiis 9, lævis, fornice squamis fornicatis.*

The printed diagnosis, or heading, was evidently drawn up from a different shell.

O. PELLUCENS. *Pec. radiis 9, lævis, fornice squamis cochleari-hemisphæricis.*

No name was attached to this or the next shell.

O. SANGUINEA. *Pec. radiis 22 scabris, semiauritus.*

The reference was not to plate 74 (as printed) of Gualtieri, but to plate 73. "*Purpureus nigro undatus*" was written after the indicated colouring.

O. VARIA. *Pec. radiis 30 scabris explanatis.*

"Et omnia eadem" followed "*sanguinea*"; "*striis compressis echinatis*" was not present; "*color pallidior*" was in the place of "*concolor*."

O. PUSIO. *Pec. radiis 40 filiformibus.*

O. GLABRA. *Pec. radiis 10 lævibus planiusculis, internis striis elevatis duplicatis.*

Gualtieri's rude drawing was not quoted.

O. OPERCULARIS. *Pec. radiis 20 subrotundis, decussate striato-scaber, operculo convexiore.*

O. GIBBA. *Pec. radiis 20 glabris, gibbus.*

Brown's drawing was not quoted.

O. FLAVICANS. *Pec. radiis 8 striatis, margine altero rotundato.*

As in the 'Systema,' the next two shells, along with this, formed a group distinguished as having the "*Valvulis altero latere magis gibbis*." No

names had been appended to this, the three preceding, and the two following species.

O. FASCIATA. *Pec. radiis 20, auriculis æqualibus exoletis.*

The "gibba" of the borrowed diagnosis was not, it may be observed, in the original.

O. LIMA. *Pec. radiis 22, imbricatis squamis, altero margine rotundato, auriculis oblitteratis.*

The "gibba" of the borrowed heading was not in the original diagnosis. The final remark was likewise absent.

O. ISOGNOMON. The entire account of this species was added to the copy in the Linnean handwriting. "Klein, 128. t. 8. f. 15. Isognomon" and "Cardo ut ephippo" had been omitted in printing.

O. MALLEUS. *O. trilobum.*

"Transverso ad marginem" was a subsequent addition.

O. FOLIUM. *O. ovatum, lateribus obtuse plicatum.*

Klein's copy (t. 8. f. 22.) of the indicated figure in Rumphius was cited, in the handwriting of Linnæus: "the "cavitate conica" was an emendation.

O. EDULE. *O. subrotundum semiorbiculatum, valvula altera plana integerrima.*

There was no semicolon after "opaca," but a comma after "latiore." The original sole synonym was the omitted one of "Gualt. t. 102. f. B."

O. SEMIAURITUM. *O. semiauritus ovatum læve, basi obliqua.*

Linnæus himself had added this species to the earlier catalogue.

O. EPHIPPium. *O. submembranaceum curvum, cardine octosulcato.*

In addition to the published *Ostreæ*, the following description of the shell subsequently termed *O. perna* (Syst. ed. 12.) was found in the manuscript:—

O. rugosum, inæquale, tumidiusculum, cardine octocrenato.

Testa perniformis, obovata, substantia ligni antiqui, tumidiuscula, superficie obsolete rugosa, inæquali, interne livida. Cardo transversus, margine inflexo, notatus crenis obtusis circiter 8.

ANOMIA.

The single species here mentioned was comprehended in *Ostreum*.

A. PLACENTA. *O. orbiculatum planum pellucidum.*

Reference was made, by a long periphrasis, to plates 225, 226 of Lister's 'Historiæ'; Seba was not quoted: "intra discum testæ adnatis" was absent.

MYTILUS.

Testa opaca, læviuscula. Cardo nullis dentibus instructus, sed fossula obliqua intra marginem.

This definition very properly excluded the oysters which had been erroneously inserted in this genus. Only the *Mytili* and *Modiolæ* of Lamarck were left as members; for *margaritiferus* and *hirundo* were transferred to *Ostreum*!!

M. FRONS. *Ost. acutum plicatum, labio altero scabro.*

M. CRISTA-GALLI. *Ost. acutum, plicatum, labio utroque scabro.*

The reading of the MS. was not "secundum marginem insculptus," but "secundum marginem *Mytilus*."

M. HYOTIS. *Ost. subacuto-plicatum imbricatum squamis compressis, labio utrinque glabro.*

M. MARGARITIFERUS. *Ost. semiauratum, imbricatum tunicis, basi transversum.*

"Bonan. 2. f. 1." was the omitted synonym. The description of the hinge was not at first inserted.

M. UNGUIS. *M. subrotundus, longitudinaliter striatus, pellucidus.*

This ambiguous species was not named, but placed next to *Ostrea edulis*. I entertain but little doubt of its being a young *Perna*.

M. LITHOPHAGUS. *M. cylindricus.*

Neither Gualtieri nor d'Argenville was referred to, which confirms my idea that the species of the 'Museum' (termed *coriaceus* in the manuscript) was not the Mediterranean *Lithodomus*.

M. BILOCULARIS. *M. striatus, cardine fornicato.*

M. EXUSTUS. *M. striatus, dorso angulato.*

M. EDULIS. *M. lævis, subcurvatus, cardine terminali mutico.*

The printed synonyms are additions. From the "crassa," and the "absque denticulo," it is by no means improbable that some large exotic species was intended. The proposed name was *niger*; and that word originally formed part of the heading, but had been erased by Linnæus.

M. UNGULATUS. *M. læviusculus, valvis obliquis postice dilatatis, antice apice.*

"Lineis" was "tunicis" in the original. I do not consider that the details of this species (the *M. rusticus* of the MS.) pertain, even generically, to the *ungulatus* of the 'Systema.'

The large *Mytilus* represented by Gualtieri was not quoted: the reference, on the contrary, was to the two *Modiolæ* depicted by Rumphius ("Rump. 151. t. 46. f. B. C.") and to their Kleinian names ("Klein, 127. *Musculus acutus vulgaris*, a. b."); and to that genus, rather than to *Mytilus*, does the account of the suture, and the final remark, apply.

M. MODIOLUS. *M. lævis, cardine sublaterali, margine dorsali dilatato.*

The erroneous, yet approximate, synonyms of Rumphius and Gualtieri (the 4 H's of whose engraving represent 4 different shells) were not quoted in the original. The species (for want of a good figure) was not clearly defined until the twelfth edition of the 'Systema.'

M. VIRIDIS. *M. lævis membranaceus, cardine terminali.*

M. RUBER. *M. rugosus, valvulis obliquis, postice dilatatis, margine antico apicem æquante.*

The preceding mussel spoken of was not *viridis*, but *ungulatus*. The reading was not "brevissimo, compresso," but "brevissime compresso."

M. HIRUNDO. *Ost. valvis bilobis, lobo anteriore angustiore longiore.*

"Bonan. 2. f. 57" (error for 58) and "List. 220. f. 55" were quoted.

PINNA.

The definition was not precisely similar in words to that of the 'Systema,' but the sense varied but little. It ran as follows:—

Testa oblonga, membranaceo-fragilis, basi angustata. Cardo nullus, sed valvis altero latere coadunatis ut una appareat.

P. RUDIS. *P. rugosa squamis fornicatis per seriem digestis.*

The name of this shell, identified (I think wrongly) by our author with the one he had termed *rudis* in the 'Systema,' was originally *fornicata*.

P. NOBILIS. *P. squamis canaliculato-tubulosis subimbricatis.*

P. MURICATA. *P. striata, squamis concavis ovatis acutis.*

"List. Hist. t. 370. no. 215," and "Sloan. Hist. i. p. 254," were present among the original synonyms.

P. ROTUNDATA. *P. squamis obsoletis, testæ margine rotundato.*

P. SACCATA. *P. nuda saccata erectiuscula.*

P. DIGITIFORMIS. *P. nuda digitiformis incurva.*

P. LOBATA. *P. nuda lobata.*

In addition to the printed species, an anomalous *Pinna*, which I doubt not was the *Lingula anatina*, is here described.

P. VIRIDIS. *P. ovalis, basi compressa.*

Generis dubii huc relata, donec certiora determinantur.

Testa utraque ovali-oblonga, viridis, intus magis pallida; quasi compressa, et fere naviculata, acutior.

ARGONAUTA.

The intended name of this genus was *Cymbium*, the one applied to it by Gualtieri.

A. ARGO. *Cym. carina dentata.*

"Bonan. 1. f. 13," and "Klein, 3. t. 1. f. 3," were the unprinted synonyms. The intended specific epithet was *C. papyraceum*.

NAUTILUS.

There was no definition of either this, or of the preceding genus, in the written catalogue.

N. POMPILIUS. *N. apertura cordata, anfractibus contiguus.*

The unprinted synonyms were "Bonan. 1. f. 1, 2," "Breyn. Polyth. 14," "Pet. Amb. t. 3. f. 7," "Pet. Gaz. t. 99. f. D," "Klein, 2. t. 1. f. 1, 2," and "Bellon. Aquat. 318. t. 382." Seba was not quoted.

N. SPIRULA. *N. apertura orbiculari, anfractibus distantibus.*

The I in the reference to Rumphius was a misprint for the written I; "Bon. 1. f. 39," "Breyn. Polyth. 21. f. 2," "Klein, 5. t. 1. f. 6," and "Petropol. Mus. 532. n. 6," were the unprinted synonyms: "tubo" was an emendation.

CONUS.

Testa oblonga, cylindrica, deorsum attenuata. Apertura longitudinalis. Labium edentulum. Os non reflexum. Columella integra.

This most natural genus had the precise limits ordinarily assigned to it.

C. MARMOREUS. *C. conicus fuscus, maculis ovatis albis.*

"Bonan. 3. f. 123" was an additional synonym; the "versus basin transverse striata," and "subtruncata, apice prominulo," with the account of the variety, were not found in the MS.

C. IMPERIALIS. *C. pictus fasciis flavis cingulisque linearibus albo fuscoque articulatis.*

The "obconica" was simply "conica"; there was no description of the spire.

C. LITERATUS. *C. conicus albus punctis fuscis.*

The spire was not described: the reference to d'Argenville was I, not Q.

C. VIRGO. *C. striis convexis lævibus, basi cærulescente.*

"Longa" was originally "magna": the erroneous reference to Gualtieri was not inserted.

C. CAPITANEUS. *C. conicus, basi fusca, spiræ anfractibus adscendentibus.*

At least two species were confused; but, from the heading, it is clear that *C. generalis*, rather than *C. capitaneus*, was the typical form: the latter was the variety *g*.

The V in the reference to Rumphius was a misprint for the written Y: "Gualt. t. 20. f. G." and "Pet. Gaz. t. 27. f. O." were additional synonyms. "Notata lituris undatis fuscis" was not in the manuscript.

C. PRINCEPS. *C. flavus, lineis fusco-purpureis longitudinalibus ramosis.*

"Sub" preceded "convexa."

C. AMMIRALIS. *C. basi punctato-scaber.*

After "summus" was written "cingulo albo"; after "ordinarius," "cingulo nullo"; Seba was not quoted; "pruniformis" was the earlier reading for "conico-convexa, pyriformis." The variety *a*. was described as "circumdata lineis numerosis albis nigro articulatis, quarum quæ cylindrum distinguit a spira latior maculis albis nigrisque majoribus alternantibus." The variety *g*. was not originally present in the catalogue, but was interpolated by Linnæus. "Hæc pretiosissima ut vendita fuerit 500 florenis" was the final remark.

C. NOBILIS. *C. subcylindricus lævis glaber, spira acuta argute canaliculata.*

"Cacumen" was a misprint for the written "acumen."

C. GENUANUS. *C. pictus cingulis linearibus albo fuscoque articulatis.*

A strange confusion took place between the details of *C. senator* and *C. Genuanus*. The published description belonged to the former, the synonym to the latter, and should have preceded the following brief description:

"Testa conica, pallida, glauca, oblongiuscula. Lineæ 19 transversæ fusco-nigræ s. purpurascentes albo interruptæ, alternæ sæpe angustiores. Spira subconica, obtusa."

C. GLAUCUS. *C. emarginatus, basi striatus, spiræ inermis anfractibus convexis.*

C. MONACHUS. *C. gibbus acutus, fusco-cærulescente nebulosus, basi striatus.*

Bonanni was not quoted in the written copy.

C. MINIMUS. *C. cinerascens, punctis oblongis cinctus.*

The original description has been much altered by Linnæus. It ran as follows: "Testa ovata, glauco-cinerea, gibba, striæ transversales plus 30 punctis fuscis oblongis. Spira convexa, alba, maculis fuscis magnis transversis." The cited figure does not even suit these meagre characteristics, which might have been equally applied to *C. glaucus*.

C. RUSTICUS. *C. ovatus, basi rugoso-scaber, spira conica convexa.*

The variety was not noticed, and d'Argenville was not quoted in the original catalogue. "Flavo et glauco" should have been "flavo aut glauco," as written.

C. MERCATOR. *C. ovatus, albus fasciis reticulatis flavis.*

C. BETULINUS. *C. subemarginatus, basi rugosus, spira planiuscula mucronata.*

Seba was not cited.

C. FIGULINUS. *C. emarginatus, basi rugosa, spira convexa acuta.*

An additional synonym, "Rump. t. 31 (error for 33, there being no number 1 in that plate) f. 1," was indicated.

C. EBREUS. *C. ovatus albus fasciis nigris ex maculis transversis.*

"Pet. Gaz. t. 99. f. 12." was quoted.

C. STERCUS-MUSCARUM. *C. emarginatus, basi striatus, spiræ anfractibus canaliculatis.*

Of the two species confounded under this designation the *C. arenarius* appeared as a variety in the manuscript. Of the typical form "Spira lævi," "Pet. Gaz. t. 75. f. 1," and "Rumph. Mus. t. 33. f. Z," were cited as illustrations; the other synonyms were ascribed to "Var. a. coronatus spinis obtusis." The colouring was not mentioned.

C. VARIUS. *C. scabro-coronatus, elongatus, spira coronata acuta.*

C. GRANULATUS. *C. scaber inermis, striis lævibus.*

The original size indicated was "magnitudine coryli."

C. MAGUS. *C. subcylindricus, fasciis longitudinalibus albo punctatis.*

The erroneous figure of d'Argenville was not referred to; and the 32, Q (as in the 'Systema'), not 34, A, of Rumphius was quoted as illustrative. The final remark had been interpolated by Linnæus.

C. STRIATUS. *C. ovato-oblongus gibbus nebulosus, striis tenuissimis parallelis fuscis.*

The "Cæterum testa minus ante convoluta est," is a press addition. "Pet. Gaz. t. 98. f. 9." was correctly cited.

C. TEXTILE. *C. pictus venis reticulatis luteis, maculis luteis fuscisque.*

The intended name (*C. drador*) was an amusing specimen of conchological Latin: it was of course borrowed from d'Argenville's appellation of "*Drap d'or*." "*Columella ad postica quasi replicata est*" was added in the printing; the "luteo" was originally "albo"; the "subconica" was "anfractibus subconicis"; and there was no mention of a variety.

C. AULICUS. *C. pictus venis reticulatis fascisque longitudinalibus interruptis fuscis.*

"*Columella postice replicata est*," and the objectionable "*obovato-sub*," were not in the copy. No figures were cited in the original catalogue.

C. SPECTRUM. *C. cærulescens, flavo-nebulosus, punctis striisque alboluteis.*

The original description did not comprise those characteristics which are so much at variance with the essentials of the *C. spectrum* of authors. The following passages were omitted: "*gibba, minus arcte convoluta*" (this replaced "*conica*"), "*Columella postice striata et replicata. Intus testa sub-cærulescens*," "*mucrone cingulis granulato*."

C. BULLATUS. *C. flavus, albo nebulosus.*

The account of the variety, and the "*vix tuberculata*," were absent from the manuscript.

C. GEOGRAPHUS. *C. oblongus gibbus coronatus.*

The Rumphian name was the one attached to this species in the written copy.

C. TEREPELLUM. *C. scaber inermis, striis tuberculatis.*

The synonyms attached to the published details were "*Gualt. Test. t. 25. f. L.—Arg. Conch. t. 16. f. P.—Rumph. t. 33. f. EE*." Now these harmonize with both the heading and the description, and clearly indicate the *C. Nussatella* of the 'Systema'!

The details attached to the published synonyms (which latter belonged to the *C. terebellum* of the 'Systema,' and to which were joined "*Gualt. t. 23. f. O.—Bonan. 3. f. 57.—Pet. Amb. t. 13. f. 24*," ran as follows:

"*Testa cylindræa, glabra, antice angustior, desinens in spiram attenuatam, anfractibus 3. Basis truncata, tenuis. Columella non torta, sed involuta. Color pallidus.*"

CYPREA.

Testa ovata lævis involuta. Apertura linearis, utrinque dentata. Spira occultata intra testam.

C. MAPPA. *C. subturbinata characterisata, macula longitudinali dentata.*

"*Pet. Amb. t. 16. f. 2*," was an omitted synonym. The terminal remark is an improvement upon the earlier "*Noscitur linea utrinque dentata in superficie scripta*."

C. ARABICA. *C. subturbinata characterisata, macula longitudinali simplici.*

"*Denticulis testaceis*" and the description of the variety were additions by the hand of Linnæus.

C. ARGUS. *C. subturbinata subcylindrica, maculis annularibus.*

The synonyms of Petiver (t. 97. f. 6) and Bonanni (f. 263), quoted in the 'Systema,' were also present in the MS., where "*2. s. 1*" was in the place of "*duabus*." The "*pallidis*" was a misprint for the written "*pallidæ*." The account of the variety was subsequent to the copy.

C. TESTUDINARIA. *C. obtusa cylindrica, extremitatibus depressis.*

"*Pet. Amb. t. 8. f. 7*," was an unprinted synonym.

C. CARNEOLA. *C. subturbinata pallida, fasciis incarnatis.*

C. TALPA. *C. subturbinata violacea, fasciis pallidis.*

"Pet. Amb. t. 16. f. 1." was an unprinted synonym: "pallide flavesceus" was the earlier reading for "testacea." The final remark was not in the copy.

C. AMETHYSTE. *C. subturbinata, dorso violaceo.*

Rumphius was not originally cited as illustrative.

C. VANELLI. *C. subturbinata, maculata punctis lutescentibus.*

"Obsoletis" was originally in the place of "acutis": the "sæpe lutescentibus" was an addition of the press. *C. Ovum Vanelli* was the intended designation.

C. LOTA. *C. subturbinata alba, denticulis subulatis.*

C. FRAGILIS. *C. subturbinata gibba fragilis, obsolete fasciata.*

Linnæus himself inserted this heading, with the first three lines of the printed details, in the manuscript copy. Neither the reference, nor the longer account of the variety (evidently a different species) appeared there.

C. CAPUT-SERPENTIS. *C. obtusa triquetro-gibba, postice obtusiuscula.*

"Fusis" was the earlier reading for "confertis."

C. MAURITIANA. *C. obtusa triquetro-gibba, postice depresso-acuta.*

"Pet. Gaz. t. 96. f. 8. ex Insula Mauritiæ" was added in the manuscript: "fuscus" was the earlier version of "fusco-testaceus."

C. VITELLUS. *C. subturbinata livida, maculis albis.*

The published reference was substituted for "Bonan. 3. f. 254," a more characteristic figure: "maxima ex parte distincta, sed" followed "Spira." "Albida," not "alba," was the tint at first ascribed to the base.

C. MUS. *C. obtusa subovalis gibba cinerea, fascia longitudinali fusca.*

Our author himself inserted the account of this species in the manuscript. Seba was not quoted. "Habitat in Carthageria" was appended to the description.

C. TIGRIS. *C. obtusa ovata, postice obtusa.*

In the synonym of Rumphius, 36 is a misprint for 38: the erroneous reference to the H of Gualtieri was not in the copy, where "Pet. Gaz. t. 96. f. 7" was indicated as illustrative. The printed additions were "aut alba," "fusco-ferrugineis" (in lieu of "fuscis"), and "s. alba, quasi exarata; postice subcylindrica, truncata"; the previous words "Linea, &c." of that sentence were also absent from the original description, but had been inserted by the hand of Linnæus. "Postice" preceded "planiusculo," and "subviolaceo" followed "nitore."

C. LYNX. *C. oblongo-ovata, linea flavescente, postice acutiuscula.*

No variety was mentioned in the written copy.

C. ISABELLA. *C. obtusa cylindrica, extremitatibus luteis.*

"Pet. Amb. t. 16. f. 16." was cited in the manuscript, where the final remark was wanting.

C. ONYX. *C. umbilicata, subtus fusca.*

Neither of the synonyms was quoted in the copy.

C. SUCCINCTA. *C. umbilicata, labio interiore utraque extremitate rotundato.*

The entire account of this shell (the *C. bicincta* of the MS.) was added to the copy by our author.

C. ZICZAC. *C. umbilicata*, sub*tus* lutea punctis fuscis.

None of the cited figures were referred to in the original, where "interiore" stood in the place of the printed "utroque fusco."

C. HIRUNDO. *C. umbilicata*, supra cærulescente.

"Sparsis", "s. fusca", "neon macula, &c." were emendations of the press: "postice" preceded "fere marginato" in the original.

C. ASELLUS. *C. umbilicata* alba, fasciis tribus fuscis.

"Pet. Amb. t. 16. f. 18." and "Pet. Gaz. t. 97. f. 11." were cited in the copy as illustrative.

C. CRIBRARIA. *C. umbilicata*, maculis albis.

"Margo" preceded "adscendens" in the copy, in which "livide flavo" was found in place of "luteo": "flavicantibus" was omitted. The intended name was *C. Argiolus*.

C. ERRONES. *C. umbilicata*, macula testacea æquali.

Erratica was the original specific appellation.

C. MONETA. *C. marginata-nodosa*.

"Pet. Gaz. t. 97. f. 8." and "Pet. Amb. t. 16. f. 8." were omitted in printing; "subflavescente" followed "convexo"; "sub*tus* planiuscula" and "incisis" were absent. In place of the final remark (added, however, by the hand of our author), there originally stood "Noscitur tuberibus quinque elevatis."

C. ANNULUS. *C. marginata* annulo flavo.

The "s. rotundata" was added in printing.

C. EROSA. *C. marginata* flava albo-punctata.

"Undique aspersa" and "Macula fusca notat medium utriusquelateris" are the printed emendations.

C. HELVOLA. *C. marginata*, postice crenata, sub*tus* flava immaculata, supra albo punctulata.

The final remark was unwritten, and the size not mentioned: "marginis gibbi" was "margine exteriore gibbo", and "subcrenati" was "latere subcrenato."

C. STOLIDA. *C. marginata* variegata cinereo testaceoque.

"Quinque" and "adspersis" were not in the original.

C. OCELLATA. *C. marginata* lutea, ocellis nigris.

C. FLAVEOLA. *C. marginata* fulva, albo punctata.

C. PORARIA. *C. marginata* subviolacea, albo punctata.

C. PEDICULUS. *C. transversim* sulcata.

"List. 168. t. 3. f. 17." and "Barr. t. 1326. f. 28." were cited in addition to the printed synonyms. The last four words of the description were not in the copy.

C. NUCLEUS. *C. sulcata* punctata tuberculis, rostrata.

"Pet. Amb. t. 16. f. 11." was cited as illustrative.

C. STAPHYLÆA. *C. punctis* elevatis sine striis, subrostrata.

The printed "minus" has been substituted for the earlier "vix";

"lutea" for "flava"; and "totam basin" for "maximam partem baseos."

C. GLOBULUS. *C. rostrata lævis.*

The printed additions were "alba s.", "extremitate utraque" (in place of "postice"), "Superficies punctis vix manifestis notata", and "excurrentes in strias".

BULLA.

Testa subrotunda, inflata, lævis. Apertura oblonga, non utrinque dentata. Spira obsoleta. Columella obliqua.

The *Murex ficus* and *rapa* of the printed edition were originally located in this genus, from which *Auris Midæ*, *Auris Judæ*, and *achatina* were excluded: the two former were placed in *Morion*, the last in *Buccinum*.

B. OVUM. *B. birostris*, labio dentato.

"Arg. t. 21. f. A." "Pet. Gaz. t. 94. f. 7." "Pet. Amb. t. 8. f. 6." were additional references in the written copy: "magnitudine ovi gallinacei", "apice et basi producta", were emendations during the printing. The "dilatata" was originally modified by a "parum."

B. VOLVA. *B. birostris*, rostris elongatis striatis.

"List. t. 711. f. 63" had been added to the copy by the hand of Linnaeus. The mode of reference (not, as in the earlier writings, by sections and chapters) evinces that this addition was, in all probability, subsequent to the publication of the work.

B. VERRUCOSA. *B. angulata*, aucta utrinque puncto osseo.

The correct synonyms of "Arg. t. 21. f. M." and "Pet. Gaz. t. 97. f. 22." were found in the manuscript: the printed emendations were, "magnitudine ovi passerini", "uti antierius", and "granis duobus" for the earlier "punctis."

B. GIBBOSA. *B. angulata*, cingulo elevato.

"Bonan. 249", "List. t. 711. f. 64", "Pet. Gaz. t. 15. f. 5", were cited in the copy: "præcedentis magnitudine", "solidiorque", with the modification of "cylindrica" by a preceding "sub", were press emendations.

B. NAUCUM. *B. rotundata* pellucida.

The size was not at first mentioned.

B. AMPULLA. *B. rotundata* opaca.

The printed "nulla" replaced the earlier "descendens, nuda", and "pallido-testacea" the written "albida." The "antice, nullus vero postice" was an emendation of the press.

B. PHYSIS. *B. spira obtusa*, lineis crispata.

"Sæpe", "hiansque", "tenue", and the name, are not to be found in the written copy: "apicem" was the reading for the printed "ventrem, adnatum."

B. AMPLUSTRE. *B. spira elevata*, fasciis incarnatis.

B. PALLIDA. *B. spira elevata acuta*, corpore cylindrico.

So very many changes has this puzzling species experienced in the works of our author, that it has been thought advisable to transcribe the written description from the manuscript copy:—

Testa ovato-cylindrica, glabra. Spira convexo-conica, mucronata. Columella multum torta. Color lividus, longitudinaliter griseo undulatus.

This evidently was a very different shell from the four-plaited, pale pink, and often variegated specimen described in the printed copy. The description of the outer lip, the name, and the terms "solida", "lævigata, obsoletior" were, likewise, additions of the press.

B. CANALICULATA. *B. cylindrica lævis, spiræ anfractibus canaliculatis.*

The entire account of this species was added to the manuscript in the Linnean handwriting.

B. ACHATINA. *Buc. glabrum, apertura integra.*

"Colum. Aphr. 18. t. 16" was the omitted synonym: "vel inæqualiter ovata" and the entire account of the base (merely described as "vix manifeste emarginata") were the printed additions.

B. AURIS-MIDÆ. *Morion ovali-oblongum, spira rugosa, labio interiore bidentato.*

Figure 122 of Klein's seventh plate was correctly quoted as illustrative: "crudæ" preceded "niger."

B. AURIS-JUDÆ. *Morion oblongus, spira lævi, labio interiore tridentato.*

B. SOLIDULA. *B. ovata opaca striata, spira elevata.*

I do not doubt, from the "ovata", that *Tornatella flammea* was the shell originally here intended; for the inharmonious account of the inner lip (as well as of the outer one) was not found in the manuscript,—from which, too, the erroneous reference to Bonanni was at first absent. The "acutiuscula" was "obtusiuscula": the "postice rotundata, antice acuta" was an improvement upon the earlier "pone gibba."

B. LIVIDA. *B. spira elevata obtusa, corpore cylindrico.*

This heading makes no mention of the columellar plication of the shell so named in the 'Systema,' and confirms my surmise of their distinctiveness. The name *livida* was not originally attached to the description, but had been added (together with "obsoletis") by Linnæus, from a mistaken identification.

There has evidently been some error in the comparison with *Voluta Caffra*. I suspect that *Conus bullatus* was meant, as the contrasting characters answer admirably. "Differt a *B. pallida et livida*, quod testa solida—anfractus spiræ canaliculati". This passage shows that "fragilis et spiræ anfractus obtusæ" referred to *livida*, not to *Caffra*.

VOLUTA.

Testa oblonga, subconvexa, basi emarginata, replicata in canalem rectum. Columella plicata oblique. Labio integro.

The genus appears to comprehend precisely the same members as in the published edition. They were arranged in sections exactly corresponding with the Lamarckian genera of *Oliva*, *Voluta*, *Mitra*, and *Marginella*.

V. PORPHYRIA. *V. spira basi oblitterata, labio medio retuso.*

Linnaeus spoilt his excellent earlier description by his attempted emendations. The interpolated "Faux sæpius rufescens" (misprinted virescens), and the reference to Gualtieri's figure O. (*O. erythrostoma*), formed no part of the original version.

The "Varietas fere sola est *V. Olivæ*" was an afterthought.

V. OLIVÆ. *V. spiræ basi reflexa.*

The synonyms were thus distributed. To var. *a*, Rumph. t. 39. f. 2, and Gualt. t. 23. f. B; to var. *g*, Rumph. t. 39. f. 3; to var. *e*, Arg. t. 16. f. R; to var. *d* ("Cæsius atro-undatus," not "Fusco undulatus" as printed), Rumph. t. 39. f. 4. The expressions "ponderosa" and "magis sulcatum" were not in the original.

V. ISPIDULA. *V. spira adscendente, margine unico.*

"Pet. Gaz. t. 59. f. 8," cited in the 'Systema,' was also written in the manuscript: not so the "Varietas forte præcedentis *V. Olivæ*." None of the drawings exhibit the produced spire, which must have resembled that of *O. jaspidea*. The earlier name was *ispida*.

V. GLABELLA. *V. ovata lævis, labii margine reflexo, basi rotundata.*

The reference to Gualtieri (a doubtful figure) was not originally inserted. The intended name was *V. polita*.

V. CAFFRA. *V. fusiformis lævis.*

The absurdity of asserting, in relation to this and the next species, that each resembled the other, but was larger, arose from the circumstance that when our author, in revising the labours of his amanuensis, added "sed major," he omitted to erase it from the following species.

V. VULPECULA. *V. fusiformis angulata inermis, transversim striata.*

Of the ample details the first two paragraphs only were found in the manuscript. The proposed name was *V. picta*.

V. PLICARIA. *V. fusiformis, angulis antice subspinosus.*

The intended appellation *angulata* was changed from an erroneous impression of the identity of the species with the *Turricula plicata* of Rumphius. "Mucronatis" and "albidus" were emendations. "Bonan. 8. f. 65" was referred to, as in the 'Systema'.

V. PERTUSA. *V. fusiformis, labro denticulato, striata punctis pertusis.*

V. denticulata was the name originally proposed for this *Mitre*.

V. MITRA. *V. fusiformis lævis, labro denticulato.*

The final paragraph was not in the manuscript, where "Bonan. 3. t. 119, 120", and "Klein, 36. Mitra episcopi", the former cited in the 'Systema', the latter a mere name, were quoted as illustrative.

V. MUSICA. *V. spinis obtusiuseulis, columella plicis 8.*

The reference to the letters X. and Y. of Gualtieri (neither of which are illustrative) stood not thus in the original: the characteristic Z. of that work was the figure really cited. The printed edition has been enlarged by an "ob" before "ovato" the addition of "solida", and the description of the lips.

V. VESPERTILIO. *V. spinis acutis, columella plicis 4.*

The only printed additions are "ob" before "ovato", "s. glauca", and "fuscis lineis" in place of the "saturatus."

V. ÆTHIOPICA. *V. spinis fornicatis cingentibus apicem papillarem.*

"Habitat in mari Pacifico", "Pet. Amb. t. 7. f. 5" (copied from Rumphius, t. 31. f. B.), and "Bonan. t. 3 f. 1" (cited in the 'Systema') were the unprinted additions.

V. CYMBIUM. The entire account of this shell was in the handwriting of Linnæus, and inserted at a later period than the mass of species. The decided reference to Gualtieri was not in the manuscript.

V. OLLA was not mentioned in the written catalogue.

In addition to the species published in the 'Museum,' the following were also characterized in the manuscript:—

V. FABA. *V. ovata, antice subplicata, labii exterioris margine reflexo, basi rotundata.*

Bonan. 3. f. 49.

Testa magnitudine vix fabæ, ovalis, lævis, antice subplicata, livida, punctis fuscis aspersa. Spira testæ $\frac{1}{2}$ brevior, subplicata. Labium exterius reflexum, basi rotundatum integrum.

This was evidently the shell so designated in the 'Systema.'

V. GRANULATA. *V. fusiformis, sulcis longitudinalibus, striisque transversalibus.*

Rumph. Mus. t. 29. f. V.

Arg. Conch. t. 12. f. V.

Testa facie antecedentis, sed sulci et striæ contrariæ, fusiformis, sulcis longitudinalibus elevatis obtusis, striis transversalibus exaratis. Color cinereus, fasciis linearibus 2 rubris ex punctis. Spira longitudine ventris. Apertura præcedentis.

This was the *V. sanguisuga* of the 'Systema.'

The preceding species referred to was

V. LIMA. *V. fusiformis, sulcis transversis, striisque longitudinalibus.*

Rumph. Mus. t. 28. f. T.

Testa fusiformis, scabriuscula, striis longitudinalibus secundum testam, et sulcis secundum anfractus adscendentibus margine acutiusculis. Color albidus sulcis elevatis rubris—albidus sulcis elevatis flavis albo interruptis. Spira longitudine ventris. Apertura oblonga, intus alba. Basis acuta, emarginata. Labium exterius integrum; interius nullum. Columella dentibus 4 obliquis.

These features fairly enough suit the *Mitra filosa*, generally, and with reason, supposed to be the *V. filaris* of the 'Mantissa.' The cited figure however, seems *M. gracilis* of Reeve.

BUCCINUM.

The species which compose this group in the 'Museum' were originally separated under many generic designations.

1. **BUCCINUM.** Testa ovata, ventricosa. Apertura integra, semilunaris, superne extrorsum, postice introrsum.

2. **CASSIDA.** Testa ovata, gibba. Cauda reflexa oblique. Apertura longitudinalis, obliqua.

3. **LYRA.** Testa ovata, ventricosa. Apertura ovata, patens, pone submarginata. Labium interius nullum. Columella compressa, nitida.

4. **TURRICULA.** (No definition: evidently intended for all the turreted shells.)

5. **MORION.** Testa oblonga, inermis. Apertura oblonga, labio interiore reflexo unidentato.

In the first were located the *Dolia*, and *B. echinophorum*; in the second the *Cassides*, with *B. papillosum* and *arcularia*; in the third the *Harpæ* and *Purpuræ*; in the fourth the *Terebræ*; in the fifth *B. glans*, *spiratum*, *glabratum*.

B. undosum was located in *Murex*.

B. PERDIX. *B. umbilicatum subsulcatum*, basi recta.

The proposed name was *B. pennatum*, adopted from Rumphius: "lunari-patula" was not in the manuscript.

B. POMUM. *B. exumbilicatum*, labio utroque dentato.

"Barr. Ic. t. 1325. f. 12" (cited in the 'Systema'), and "Klein, 95. Semicassis, striata, costosa", were the additional synonyms of the manuscript: "s. sulcata", "nullum, interne", "at vero in adultioribus accrescit planum album", were subsequent emendations.

B. DOLIUM. *B. emarginatum subsulcatum rugosum*, labio exteriori reflexo dentato.

The *Dolium fimbriatum*, or, as Deshayes prefers it, *D. Minjac* (the Malay name was *Bia Minjac* in Rumphius, who preceded Adanson), was assuredly the shell described in the 'Museum', as the recorded dentation of the outer lip clearly manifests. An excellent figure of it in Petiver ("Gaz. t. 99. f. 11") was cited in the original copy, where the drawing of Gualtieri was not referred to.

B. ECHINOPHORUM. *B.* (changed to *Cassida*) *tuberibus* ("quaterna serie" interpolated) *nodosum*.

The reference to Rumphius was correctly written *l*, not *I*, in the original, where "albido-flavescens" was the indicated colouring. The printed emendations were "quadruplici s. quintuplici", instead of "triplici", and the entire account of the aperture, which at first ran simply as follows, "Labium exterius crassius, margine tenuiore, interne subrugosum, obsolete dentatum."

B. TUBEROSUM. *B. tuberibus gemina serie nodosum*.

The entire published account of this species had been interpolated by Linnæus in the written copy, with the exception of the "color pallidus." The "nodis anterioribus" was a misprint for "nodis acutioribus."

Gualtieri's admirable figure of the *Cassis tuberosa* of authors was not, however, cited, which confirms my statement that the species of the 'Museum' was not the *Cassis* usually so designated.

B. CORNUTUM. *Cas. acuminibus antice cingentibus, superficie reticulata.*

The I in the reference to Rumphius was a misprint for the written 1 : "maculata" was originally "maculis griseis."

B. RUFUM. *Cas. nodis sparsis.*

"Pyri" was a misprint for the written "pugni". Neither the "maculis fuscis" nor the "Variat tota albo colore" were originally present. The Rumphian name *rubra* was the one written.

B. FLAMMEUM. *Cas. longitudinaliter striata, antice subnodosa.*

To the solitary synonym our author had added "List. t. 1004. f. 69" and "Sloan. Hist. 2. p. 242. n. 2". The final remark was not in the copy.

B. TESTICULUS. *Cas. lævis, striis longitudinalibus, sulcis transversalibus.*

"Vix ullus" was at first "nullus": "læve" was not present.

B. DECUSSATUM. *Cas. lævis, striis decussatis, labio exteriore dentato.* "Bonan. Clas. 3. t. 157" was an additional synonym.

B. AREOLA. *Cas. glabra, spira papillosa.*

The erroneous references to Gualtieri, and to the figure 2 of Rumphius, were not present in the original, nor was there any allusion made to the sculpture of the inner lip.

B. ERINACEUS. *Cas. subsulcata, antice nodosa, labio edentulo, postice extrorsum denticulato.*

The entire account of this *Cassis* was interpolated by Linnæus in the pages of his amanuensis.

B. GLAUCUM. *Cas. glabra, antice muricata, labio dentato, postice extrorsum denticulato.*

The superfluous A in the reference to Gualtieri was a misprint: "inferne" was "interne": the "acuminata" and "marginatum" were emendations.

B. VIBEX. *Cas. glabra, labio edentulo, postice extrorsum denticulato.* The figures 8 and 9 of Rumphius were not cited.

B. PAPILLOSUM. *Cas. papillis decussatis, labio tenui, extus denticulato, fauce glabra.*

"Rectum" followed "exterius" in the written copy, wherein "s. albidus" and "antice sinu excavata" were not to be found.

B. GLANS. *Morion labio exteriore denticulato, interiore bidentato.*

"Labium exterius margine postico denticulato" was omitted in printing.

B. ARCULARIA. *Cas. longitudinaliter sulcata, labio exteriore tenui, interiore maximo.*

B. COSTATUM. *Lyra costis longitudinalibus, antice prominulis, alternis obsoletis.*

This diagnosis but ill suits the *Many-ridged Harp*, which, of late, has been considered identical.

B. HARPA. *Lyra costis longitudinalibus antice mucronatis.*

The shell is described in the MS. as "striata subtilissime longitudinaliter", and "Pet. Amb. t. 2. f. 2", "Pet. Gaz. t. 48. f. 13" (the latter quoted also in the 'Systema') are there substituted for the reference to Gualtieri.

The printed additions are considerable; to wit, "costæ vero striis transversis", "anfractibus costis mucronatis", "denticulatum."

B. PERSICUM. *Lyra læviuscula*, labii margine crenulato.

The erroneous citation of Grew (t. 9. f. 5, 6) in the 'Systema' had been adopted in the manuscript.

B. PATULUM. *Lyra muricata* spinis obtusis.

Neither the erroneous reference to Gualtieri, plate 51. f. A (which was designed for *Purpura hæmastoma*), nor the "color interne rufescens", is to be found in the manuscript.

B. SMARAGDULUS. *Lyra glaberrima*, columella denticulata.

Neither the erroneous reference to d'Argenville, nor the specific name derived from his figure, is to be found in the MS. The proposed appellation was *L. vitrea*. "Simillima Cassid. lapillo, sed glabra, et columella crenata" is the unprinted remark.

B. SPIRATUM. *Morion umbilicatus*, anfractibus distinctis canaliculo.

The specified colouring was "alba, maculis longitudinalibus fuscis": "pone bifidum" followed "integrum." The intended name was *M. canaliculatus*.

B. GLABRATUM. *Morion umbilico descendente flexuoso*.

d'Arg. Conch. t. 12. f. G.

"Testa oblonga, acuminata, obtusiuscula, glaberrima, anfractibus confluentibus, Neritarum maximarum pondere. Color albo-flavescens, nitidus. Apertura obliqua, profunde emarginata. Labium exterius integerrimum. Labium interius antice reflexum adnatum, dein solum brevius flexuosum, descendens ad basin. Sulcus profundus distinguit basin testæ. Umbilicus pone labium interius descendens ad basin sulco."

B. VIRGINEUM. I can find no account of this shell in the written copy.

B. UNDOSUM. The nearest approach to this species seems the variety B. of the *Murex succinctus* (the shell so named in the 'Mantissa').

M. lævis, sulcis transversis lævibus, angulo marginali.

d'Arg. Conch. t. 12. f. N. Bon. 3. f. 47.

Testa ovata, absque tuberculis, magnitudine nucis, exarata sulcis transversis pallidis, eminentibus vero lineis luteis. Spira obtusa, anfractibus rotundatis. Cauda teretiuscula. Apertura ovata, margine crasso, nec alia costa laterali crassa.

Var. B. Rugis s. angulis oblitteratis 5 longitudinalibus.

B. MACULATUM. *Turricula elongata*, anfractibus lævibus integerrimis.

The I. of Gualtieri, and the reference to d'Argenville, were printed emendations.

B. CRENULATUM. *Turric. elongata*, anfractibus margine crenatis.

The reference to Gualtieri was an emendation.

B. STRIGILATUM. *Turric. elongata*, oblique striata.

B. DUPLICATUM. *Turric. elongata* emarginata, anfractibus bipartitis striatis.

STROMBUS.

This genus, rendered more natural by the omission of *S. lividus* and *ater* (assigned to *Turricula*), appeared under the designation of HARPAGO with the following definition :—

Testa depressa, nodosa. Apertura longitudinalis. Labium antice dilatatum ultra basin.

The *Strombi* of the manuscript were the young of this genus (erased by Linnæus) and certain Lamarekian *Fusi*, *Pyralæ*, and *Fasciolarie*.

S. CHIRAGRA. *Har.* labii spinis lævibus 6, extimis recurvis, fauce striata.

"Bar. Icon. 327. f. I." was an additional synonym.

S. SCORPIUS. *Har.* labii spinis nodosis 7, fauce striata.

The published account was enlarged by the following passages, which are not to be found in the written copy: "crenulato cincta", "lato, brevi", "s. incarnata", "s. testaceo-nebulosus". "Distinctum" was originally "obscurum", and "repandus, inflexus" was "denticulatus."

S. LAMBIS. *Har.* labii spinis lævibus 7, fauce lævi.

"Bar. Icon. t. 1326. f. 7" was the synonym omitted in printing. The name was borrowed from d'Argenville.

S. MILLEPEDA. *Har.* labii spinis lævibus 10.

"Anteriora" was "posteriora" in the manuscript.

S. LENTIGINOSUS. *Har.* labio inermi integro rotundato, angulis pluribus nodosis.

The "aut marginatum" was "fragile, diaphanum", so that a young shell appears to have furnished the materials for description.

S. GALLUS. *Har.* labio inermi mucronato, cingulo dorsali spinoso.

S. AURIS-DIANÆ. *Har.* labio inermi muricato, cauda recurva, lobo incurvato.

The "32. f. H." was a misprint for the written "17. f. O." The printed additions are "usque" and "Color testaceo et albido nebulosus."

S. PUGILIS. *Har.* labio inermi obtuso, spira spinosa distincta, basi emarginata.

"Nitida", and "sed spira albida", were not found in the original.

S. LUHUANUS. *Har.* labio obtuso, antice posticeque emarginata.

Few of the details were present in the original copy, but appear to have been added, to discriminate the species from the allied *gibberulus*. "Spira obtusa brevis" was added by the hand of Linnæus; "sæpe subplicati", "postice lobo obsoleto instructum", "intus", "Columella nigricans", "Cauda nulla, sed postice emarginata", were all absent from the MS.

S. GIBBERULUS. *Har.* labio inermi, dorso lævi, spira repanda.

The printed additions are "subtus planiuscula", "læves", "fuscum", and the final remark.

S. LATISSIMUS. *Har.* labio inermi rotundato, spira subnodosa brevior, dorso lævi.

S. EPIDROMIS. *Har.* labio inermi dilatato, dorso lævi, spira subnodosa.

The *S. epidromis*, as it originally stood in the manuscript, was a recognizable species, and precisely identical with the shell so named in the 'Systema'; for the erroneous reference to Gualtieri was not present, neither was "carinato," nor any of the discordant details from "interius" to the termination. As the printed description now stands, it would suit *S. emarginatus* or *succinctus*, at the least, equally well. I doubt not our author, when correcting the press, forgot his own species, and added the partial essentials of one species to those of another.

S. CANARIUM. *Har.* labio inermi dilatato, dorso spiraque lævibus.

The erroneous reference to plate 37 of Rumphius was not present in the written copy, which contains the additional synonyms of "Pet. Gaz. t. 98. f. 11", and "Klein, t. 4. f. 73": the latter was not there originally. The early description has been improved, in the press, by the addition of "obovata", "Faux lævis, alba", and "longitudinaliter subundulatus."

S. VITTATUS. *Har.* labiis inermibus, spiræ anfractibus vitta interstinctis.

S. URCEUS. *Har.* labiis inermibus striatis, dorso nodoso.

The erroneous reference to Gualtieri was not present in the original, but in place of it the 37. W. of Rumphius (*S. mutabilis*): "Spira testa brevior, plicato-subnodosa" was, likewise, absent. "Klein, 49, urceus fimbriatus" (a name for Rumph. t. 37. f. F & W) was interpolated by our author.

S. ATER. *Turricula* labiata.

Neither the reference to Rumphius, nor the "et postice emarginatum" were found in the original. This confirms my expressed belief that the Museum species (to which no name was at first attached) was distinct from that of the 'Systema.'

S. LIVIDUS. *Turric.* labiata, anfractibus serie subspinoso.

This was located in a section of *Turricula* distinguished as having the outer lip dilated and rounded.

Besides the above, the following unprinted details were found in the manuscript:—

The *Strombus gigas* was described at length under the appellation of *Harpago gigas*.

Har. labio inermi rotundato, dorso spiraque subulato-spinosis.

Gualt. t. 34. f. A. Bar. Icon. 1727. f. 7.

Testa gibba, maxima, magnitudine capitis. Cauda obtusa. Spira spinis patentibus, subulatis, validis. Anfractus desinens in dorso spina. Series in dorso spinarum maximarum ferme conicarum. Labium dilatatum, rotundatum, spira longius, vix adnatum spiræ. Faux glabra, nitida, incarnata. Color pallidus.

The *Strombus dentatus*? was also defined (without a specific appellation) by the following characters:—

Har. labio dentato, testa lævis, plicato-nodosa.

Testa simillima reliquis, longitudine articuli digiti, lævis, flavescens, sub-

plicata, plicis antice acuminatis nodis. Spira acutiusecula, similiter plicata, nodosa. Labium exterius minus dilatatum, postice margine dentatum et interne fuscum, striatum. Labium internum crassum, integrum, læve.

The *Strombus palustris*, although not published until the twelfth edition of the 'Systema,' had been already defined in the 'Museum' as *Turricula cornea*.

Tur. decussatim rugosa, labio dilatato.

Rumph. 101. t. 30. f. Q. *Strombus palustris*.

Testa crassa, rudis, pyramidalis, cornea aut plumbea, anfractibus 12 et ultra, secundum spiras transversim aliquot striis exarata, longitudinaliter subplicata, adeoque sine spinis rugosissima. Labium dilatatum, rotundatum, concavum, edentulum.

MUREX.

The definition of this genus ran as follows :—

Testa subovata, spinosa. Apertura coarctata, ovata, desinens in canalem tubuloso-conniventem.

This was evidently designed for the *Murices* proper. The other species of the 'Museum' were distributed in the groups of *Cassis*, *Turricula*, *Bulla*, and *Strombus*. The last was defined as follows; "Testa obverse conica, nodosa, labium exterius angulum transversalem superne formans; interius nullum. Columella incurva. Cauda integra."

M. HAUSTELLUM. *M. caudatus*, subinermis, nodosus.

"Suturis" was originally "costis". The printed emendations are "gibbis, adglutinatis", "costati et nodosi", "subtus rima longitudinali clausa", "margine", and the final remark.

M. TRIBULUS. *M. caudatus*, spinis subulatis trifariis.

"Olear. Mus. t. 39. f. 1" was cited in the transcript, to which Linnæus had added "Bonan. 269" and "List. t. 902. f. 22", all which synonyms are present in the 'Systema.' The printed additions are "suturis 3 longitudinalibus, adglutinatis, incrassatis", "secundum suturas: superficies transversim striis elevatis distinctis", "recta".

M. CORNUTUS. *M. caudatus*, spinis subulatis serie gemina.

The s. in the reference to Rumphius was a misprint for the written 5: "Pet. Gaz. t. 68. f. 12" (as in the 'Systema') was present in the copy. The expressions "striata", "conicæ", "obliquo situ", and the final remark, are the printed additions.

M. TRUNCULUS. *M. subcaudatus*, spinis simplici serie.

The description of the tail and account of the variety were not originally present: "suturis" was, at first, "plicis", and "adglutinatis" was "antrorsum adnatis".

M. RAMOSUS. *M. dædaleus triangularis*, spira longitudine ventris.

Had the original manuscript been printed, the multitude of species confused under this appellation would have been somewhat lessened. For the cited figures of *M. inflatus* (Rumph. t. 26. f. A, and Gualt. t. 38. f. A), with that of another short-spined *Murex* (Arg. t. 19. f. C), were separated from

the rest, and quoted for a *M. unguis-odor*, the brief definition of which was "*M. dædaleus triangularis*, spira ventre brevior."

The published details, and the drawings of the longer-spined and more slender-bodied *Murices* (Rumph. t. 26. f. 1; d'Arg. t. 19. f. E, H.), appeared as *M. lichenoides*.

I consider, then, that in that event the *M. adustus* (Arg. t. 19. f. H.), which would tolerably suit the definition, would have been considered the typical form, and *M. axicornis* (Rumph. t. 26. f. 1, and d'Arg. t. 19. f. E.), the variety *γ*.

M. SCORPIO. *M. dædaleus quadrangularis*, spira subcapitata.

The ill-judged final remark was not in the copy.

M. SAXATILIS. *M. dædaleus quinquangularis*, spira contigua.

The idea of this being a mere variety was not expressed in the original.

M. RANA. *M. angulatus subdepressus*, costis lateralibus.

The R. of d'Argenville was properly referred to the variety B. The "alba", "sulcis transversis", and "Dorsum anfractum simplici cingulo aculeato" were not in the copy.

M. LAMPAS. *M. angulatus tuberculis nodosis*, cauda flexuosa, labio interiore lævi.

The earlier reading of "una alterave ruga" was "uno alterove denticulo."

M. FEMORALE. *M. angulato-triqueter*: angulis antrorsum acuminatis.

The intended name was *M. triqueter*. Grew's engravings (f. 7, 8) of the species were correctly cited, and the erroneous reference to Rumphius was not inserted. The printed additions were unimportant—"exarata", "repando", "sub" before "edentula", and "levissime".

M. LOTORIUM. *M. angulatus*, tuberculis conicis, cauda flexuosa, labio interno rugoso.

"Subter" was a misprint for the written "inter": the "ut in proximis" was a printed addition.

M. RUBECULA. *M. angulatus*, sulcis moniliformibus, costis lateralibus, dorsaliq̃ue.

"Gualt. t. 49. f. I". was rightly cited as illustrative: "ex" preceded "lineis".

M. RETICULARIS. *Cas. inæqualis gibba reticulata*, cauda elongata.

The erroneous reference to Rumphius was not present in the manuscript. As corroborative of my expressed belief in the identity of the species described in the 'Museum' with the *Triton ! mulus*, it may be observed, that our author has wholly separated this and the allied *anus* from the true *Tritons* and *Ranellæ*, and that the original heading corresponds accurately with the peculiar characteristics.

M. ANUS. *Cas. inæqualis*, gibba nodosa, labris rugosis.

"Pet. Gaz. t. 74. f. 9" and "Pet. Amb. t. 6. f. 4" were the unprinted synonyms. The "rugis reticulato-intertextis", "irregularis", and "patens" were emendations.

M. RICINUS. *M. ecaudatus*, ore utrinque dentato.

"Æqualibus, ad labium majoribus" was not in the copy.

M. CAPITELLUM. *M. ecaudatus ovatus, columella rugosa, labio edentulo, superficie inermi rugosa.*

"Alba" followed "edentula", and "Umbilicus ad basin" terminated the description in the original: the word "striis" was a subsequent introduction.

M. TURBINELLUS. *M. ecaudatus, turbinatus, columella dentata, spinis explicatis.*

The printed additions are "anteriores", "nodulosa", "alba", "Cauda vix ulla", and "Variat colore albo spira longiore".

M. CERAMICUS. *M. ecaudatus, utrinque acuminatus, columella dentata, spinis conicis.*

"Rumph. t. 49. f. L." was an unpublished synonym.

M. NODUS. *M. ecaudatus ovatus, labio denticulato.*

As "Gualt. t. 28. f. R." was quoted, and "aut nigris, conicis, obtusiusculis" (a character which probably belonged to some distinct species erroneously supposed to be a variety) was not inserted in the manuscript, I feel convinced that the *Purpura hystrix* of authors was the species designed in the 'Museum Ulricæ.'

M. HYSTRIX. *M. ecaudatus edentulus, fauce lævi.*

M. MANCINELLA. *M. ecaudatus, edentulus fauce striata.*

This original heading, and the absence of the erroneous synonym from the MS., confirm the received opinion of the identity of the Museum species (not that of the 'Systema') with *Purpura mancinella*.

M. HIPPOCASTANUM. *M. ecaudatus edentulus, fauce edentula integra, spinis serie triplici.*

Gualtieri's erroneously cited figure was not indicated in the manuscript. No specific name had been originally attached to the description.

M. MELONGENA. *M. ecaudatus edentulus fauce patula lævi, spinis serie duplici.*

"Bonan. 3. f. 186" had been added to the synonymy by our author. The details were less copious than in the published edition, "apice solo acuminatus" being the meagre substitute for the entire description from "Spira" to the end.

M. FICUS. *Bul. caudata, striis reticulatis, spira obtusa.*

"Pet. Amb. t. 6. f. 9" was an omitted synonym. The shell described in the 'Museum' was assuredly not the *ficus* of most writers.

M. RAPA. *Bul. caudata, striis longitudinalibus, spira acuta.*

M. FUSUS. *Turric. caudata lævis, labio dentato.*

"Bonan. f. 121" and the name had been added to the MS. by Linnæus.

M. BABYLONIUS. *Turric. caudata, transversim angulo sulcata, labio marginali versus basim sinu exciso.*

M. COLUS. *Turric. caudata striata, labio exteriori crenato.*

The printed emendations were "longa" and "s. angulati." The name was added by Linnæus. The following unnamed *Turricula* succeeded the species in the manuscript copy:—

T. caudata striata, longitudinaliter sulcata.

Testa parva, striis plurimis secundum anfractus. Anfractus scabri, sulcis longitudinalibus 15. Color anfractuum superne griseus inferne pallidus. Apertura ovata. Rostrum baseos rectum, testæ dimidio brevius. Labium tantum exterius integrum. An filia præcedentis?

M. MORIO. *Strom.* spira subnodosa, labio exteriori intus rugoso.

The synonymy, as might be expected (for Seba was unknown to Linnæus when the descriptions were written), was not in the original.

M. COCHLIDIUM. *Strom.* spira pyramidata, anfractibus planis.

The reference to Seba, the name, and the "Cauda subulata, longitudine testæ" were not present.

M. CANALICULATUS. *Strom.* spira subconvexa, anfractibus distantibus.

The "Anfractus distincti canaliculo per omnes spiras," the name, and the reference to Seba, were the printed additions. "Habitat in Canada. Kalm." was appended.

M. ARUANUS. *Strom.* incurvus spinosus ventricosus, angulo obsoleto.

The objectionable name (for assuredly the *Buccinum Aruanum* of Rumphius suits not "spinosus") was not present in the original, but had subsequently been added by our author, who seems to have erased the original "Habitat in Canada. Kalm." I doubt not that *Pyrula carica* was intended.

M. PERVERSUS. *Strom.* inversus.

The wretched engraving of Gualtieri was not cited.

M. TRITONIS. *Cas.* pyramidalis lævis, columella dentata.

"Bonan. 3. f. 188" stood in the place of Seba. The printed additions were "plerisque", "et suturis variis alternis crassis", and the specific epithet. "Genus difficile eruitur" was written after the description, and the following note erased:—"Ad genus retuli ob labium interius adnatum in quibusdam latius, ob suturas verrucosas, ob caudam canaliculatam parum elevatam, ob labium postice dentatum, quæ omnia affinitatem arguunt."

The *Triton nodiferus* was probably designed by the following description, which succeeded that of *M. Tritonis*:—

Cas. (corrected by Linnæus to *Murex*) *Neptuni*. *C.* pyramidalis nodosa, columella dentata.

Testa maxime facie statura et colore præcedentis. Anfractuum angulus summus nodis prominentibus, unde et spira nodosa evadit, quod non in præcedente. Apertura præcedentis. Labium interius magis dilatatum, maximeque planum. Columella non dentata. Habitat Constantinopoli. Edw. Carleson.

M. TRAPEZIUM. *Strom.* spira nodosa, labio denticulato, columella rugosa.

M. ALUCO. *Turric.* recurvirostra, spinosa, serie simplici.

Gualtieri was not cited, and the reference was to "N. Strombus tuberosus" (*Cerithium aluco*), not O. (*C. nodulosum*) of Rumphius. The inner lip was described as "non adnatum, sed prominens": "s. fuscis", and "Variat cauda recta, &c.", were not in the original.

Besides the published species, the following had been written, but omitted in printing:—

TURRICULA ALBA. *T. alba recurvirostra*, anfractibus margine crenulatis.

Bon. 3. t. 84. Rumph. t. 30. f. K. Pet. Gaz. t. 56. f. 4. d'Arg. Conch. t. 14. f. P. Gualt. Test. t. 57. f. D.

Testa lævis. Anfractus circiter 15, margine subcrenati. Color albus, sæpius saturatio ad marginem anfractuum. Apertura ovata, rostro canaliculato, recurvo. Labium interius adnatum, dente unico obsoleto.

This was evidently identical, from its synonymy, with the *M. vertagus* of the 'Systema.'

TURRICULA SENTICOSA. *T. reflexo-emarginata*, costis reticulatis.

d'Arg. Conch. t. 12. f. O.

Testa gibba, costis sæpius 12 perpendiculari-obliquis, intertextis striis lamellosis transversis ad anastomosases muricatis, unde admodum scabra evadit. Anfractus ventricosi, sæpius x. Color griseus. Apertura ovata, interne striata, emarginata, parum reflexa.

Evidently this was identical with the *M. senticosus* of the 'Systema.'

M. OLEAGINEUS. *M. angulis sulcis inæqualibus*, labio interiore rugoso, costis alternis.

Gualt. Test. t. 49. f. G. d'Arg. Conch. t. 13. f. M.

Habitus et structura *rubeculae*, at octies major, nec vivide pictus, sed colore testaceo fasciis fuscis longitudinalibus. Apertura intus saturate crocea, rugis albis.

Apparently this was the *Triton pileare* of authors,—not the Mediterranean shell (*T. corrugatus*) termed *M. pileare* in the 'Systema.'

M. PILEUS HELVETICUS. *M. angulis rotundatis*, tuberculis conicis, apertura utrinque canaliculata.

d'Arg. Conch. t. 12. f. D. Rumph. t. 28. f. D.

Testa ovata, admodum inæqualis, adpersa nodis conicis tuberculatis inæqualibus. Costæ latere antico membranaceæ, primæ 2 oppositæ, reliquæ alternæ. Color flavus. Apertura hians, antice et postice canaliculatæ, faux intus striata. Labium exterius dentatum, intus dilatato-membranaceum.

This suits very fairly the *Triton lampas* of authors; far better, indeed, than does the *M. Lampas* of the 'Museum Ulricæ.'

M. SUBULATUS. *M. ecaudatus*, pyramidalis.

Testa subulata instar turris, anfractuum undecim, reticulata striis elevatis decussantibus punctis contignationem eminentibus. Costæ oppositæ et alternæ. Color albus, maculis flavescentibus. Apertura ovata. Labium exterius crassum, intus dentatum. Interius dentato-glabrum.

Both *Triton! maculosus* and *Ranella candisata* approach the ideal portrait, yet neither of them precisely agrees.

Under the name of *Trochus turritus* our author appears to have first described his *Murex radula*.

Trochus exumbilicatus, pyramidatus, anfractibus duplici serie muricatis. Gualt. t. 58. f. F.

Testa elongata, flavescens s. testacea. Anfractus 16, connexi suturâ crenulatâ, dorso duplici serie instructi punctis eminentibus pallidis. Apertura subtetragona, subtus in canalis rudimentum desinens.

The *Murex Neritoideus* of the 'Systema' was thus described.

LYRA NERITOIDES. *L.* testa nodosa subrotunda.

Gualt.

Testa crassa, ponderosa, alba cum rubedine tincta, figura Neritæ, magnitudine juglandis, cincta anfractibus 5 e nodis obtusis crassiusculis. Labium interius depressum, longitudine pictum macula ferruginea.

TROCHUS.

Testa conica. Apertura quadrangularis, basi columella contorta, sinu descendens.

The last five words had been substituted for "absque sinu evidente."

T. MACULATUS. *T.* contorto-umbilicatus conicus, vertice subnodoso.

The printed description and the synonymy are so very dissimilar to the written one, that I entertain no doubt that an early definition of *T. Niloticus* (with references to "Olear. Mus. t. 9. f. 5" and "Bonan. 3. f. 102") was transmuted into that of a granular species, by the addition of "quasi granis exasperata," &c.

T. SOLARIS was not mentioned in the manuscript.

T. PERSPECTIVUS. *T.* crenato-umbilicatus convexus obtusus : margine acuto.

"Bonan. 3. f. 27, 28" was quoted, as illustrative : "costa crenata", not "costa concava", was the earlier reading.

T. HYBRIDUS. *T.* crenato-umbilicatus, convexus, undique obtusus.

The proposed name was *T. spurius*. The "absque carina, rotundata" was "absque angulis, glabra" : "albo, flavoque" preceded "variegata".

T. PHARAONIUS. *T.* umbilicatus subovatus striatus, punctis globulosis, labio dentato.

"Habitat in mari rubro, frequens. D. Hasselquist." was written : the final remark was absent.

T. MAGUS. *T.* umbilicatus convexo-conicus nodosus.

The "cinereo nebula" was a manuscript emendation by Linnæus.

T. MURICATUS. Except that "obverse" precedes "ovata", both the diagnosis and the details are precisely similar to the printed account.

T. SCABER. *T.* umbilicatus subovatus, sulcis alternis majoribus moniliformibus.

The erroneous figure of d'Argenville was not cited in the original, nor, indeed, was any name attached to the description. The whorls were said to number from 6 to 8 (not 4 or 5) ; and the aperture was termed "ovata," not "subrotunda." "Pallida", the final remark, and the present construction and enlargement of the passage relative to the inner lip (which at first ran thus, "Labium posticum condunatum, sinu postico excisum"), had been added by Linnæus himself.

T. LABIO. *T. exumbilicatus ovatus striato-tuberculatus, labio dentato.*

The erroneous figure of d'Argenville was not cited; "variegata" was the earlier reading of "marmorata"; "aliquot" of "et punctis"; "externo" of "margine". Linnæus himself had enlarged the account of the inner lip from the earlier "postice sinu excisum" to its present length.

T. ZIZYPHINUS. *T. umbilicatus conicus, striis papillosis.*

This is clearly not the imperforated *zizyphinus* of the 'Systema.' Gualtieri was not referred to; "ambitu marginati", and "in aliis clausus", were not in the copy: "columella parum obliqua" was an addition in the Linnean handwriting.

T. TELESCOPIUM. *T. exumbilicatus pyramidatus, striis exaratus; labio postice recurvato, spirali, integro.*

"Bon. 92", and "Klein 26. Pseudotrochus striatus", were the additional synonyms of the MS.

T. DOLABRATUS. *T. umbilicatus, labio postico recurvato sulcato, ovato-pyramidalis, glaber.*

The whorls were at first called imbricated. The "basis rotundata", and "in superioribus vero unica", had been added by Linnæus.

TURBO.

Testa conica. Apertura orbicularis, integra.

T. PERSONATUS. *T. exumbilicatus inermis convexus, labio postice diducto.*

The I of the reference to Rumphius was a misprint for the written l. A drawing of Gualtieri (t. 64. f. O), which accords not with the description of this species, was an additional synonym. The name had been added subsequently. *Turbo cidaris* agrees in most respects.

T. PETHOLATUS. *T. exumbilicatus ovatus lævis, anfractibus sursum obsolete angulatis.*

The written version furnishes us with the additional synonyms of "Gualt. t. 64. f. F.", and "Klein 40. t. 2. f. 51."; the latter (also cited in the 'Systema') was added by our author when he admitted the at first excluded 5. 6 of the synonym of Rumphius. The admission of the rounded-whorled variety? was evidently an after-thought.

T. CHRYSOSTOMUS. *T. exumbilicatus subovatus rugosus striatus, spinis fornicatis.*

"Klein 41. t. 7. f. 126" (cited in the 'Systema'), and the printed "in superiore serie majoribus". had been added by Linnæus in the original account.

T. TECTUM-PERSICUM. *T. exumbilicatus subovatus, spinis obtusis reflexis, subtus papillosus.*

"Forte sola varietas sequentis a loco" has been remarked by our author, who did not admit in his MS. the deceptive figure of d'Argenville.

T. PAGODUS. *T. exumbilicatus conicus spinis obtusis concatenatis, subtus papillose striatus.*

Neither "*acuminata*", nor the inappropriate "*rotundata*", were in the original account of this well-known species.

T. CALCAR. *T. exumbilicatus depressus, anfractibus supra spinis fornicato-compressis scabris.*

To his printed synonyms Linnæus has added "*Gualt. t. 65. f. N. P.*", "*List. Hist. t. 608. f. 46*", and "*Klein t. 1. f. 27*". The "*fornicatis*" was an emendation.

T. MARMORATUS. *T. exumbilicatus subovatus nodosus lævis.*

T. PIGA. *T. umbilicatus lævis conicus denticulo umbilicali.*

"*Habitat in Barbados, Jamaica*", which corrects the stated locality of the '*Systema*,' and "*Bonan. 29, 30*", "*Pet. Gaz. t. 70. f. 9*", were the additional particulars of the manuscript copy.

T. ARGYROSTOMUS. *T. umbilicatus subovatus, striatus lineis dorsalibus.*

The erroneous references to Gualtieri and d'Argenville, were not present: "*os argenteum variegatum*" was written after the reference to Rumphius, which name belongs to figure 3, not to 4, whose colouring, moreover, excludes it from being illustrative. The intended specific name was "*os variegatum*."

T. MARGARITACEUS. *T. exumbilicatus subovatus, (? angulo) dorsali elevato, ore postice diducto.*

Rumphius was not referred to in the original, where "*subtilissimis*" was in the place of "*variis*": the printed "*marginē albo*" was a subsequent emendation.

T. DELPHINUS. *T. umbilicatus depressus hispidus, spinis ramosis.*

"*Pet. Amb. t. 3. f. 1*", and "*Grew Mus. t. 11. f. 5, 6*", were also cited.

T. DISTORTUS. *T. umbilicatus muricatus undique spinulis brevibus.*

The final remark was not in the original.

T. SCALARIS. *T. cancellatus conicus, anfractibus distantibus.*

"*Pretium immensum, sæpe 100 ducatorum*", was the final remark instead of the printed one. "*Pet. Amb. t. 2. f. 9*", was an additional synonym in the written version.

T. CLATHRUS. *T. cancellatus pyramidatus, anfractibus contiguīs lævibus.*

All the synonyms of the tenth edition of the '*Systema*,' together with "*Johnst. t. 11, f. 9*", were present in the MS., but most of them, together with the final remark, had been subsequently added to the copy by our author.

T. CRENATUS. *T. cancellatus pyramidatus, anfractibus contiguīs supra crenatis.*

The details of the '*Museum*' were referred to before their publication. "*Pyramidalis*" was the earlier reading for "*turrita*"; "*sæpe*" was absent: "*transversim*" preceded "*crenati*."

T. UVA. *T. cancellatus ovatus, anfractibus contiguīs imbricatis.*

"*Pet. Gaz. t. 27. f. 2. Olivaris*" was the unpublished additional synonym, and the intended name was borrowed from that work. "*Longitudinalibus*" was "*transversis*" in the copy, where "*ut latus planum non conspiciatur exterius distincta linea*" terminated the account of the volutions: the colouring ("*alba*") was not indicated.

T. CORNEUS. *T. umbilicatus*, anfractibus teretibus decussatim striatis, oris margine reflexo.

The "s. cornea", the name, and the "vix manifeste" had been added to the original account, which latter was referred to previous to its publication.

T. IMBRICATUS. *T. pyramidalis*, anfractibus deorsum subimbricatis.

The "præcedentibus tribus", here mentioned, were not those which the species now follows, but nos. 358, 359, 360, after which it was placed in the MS. "Grisea" had been added by Linnæus.

T. REPLICATUS. The entire account of this shell was interpolated in the MS. by Linnæus.

T. ACUTANGULUS. *T. pyramidalis*, sulco unico acuto majore.

The last four words of the details were written subsequently to the earlier description, to which no name was then appended.

T. DUPLICATUS. *T. pyramidalis*, sulcis 2 acutis.

"Bonan. 3. f. 114", and "List. 160. t. 3. f. 7", were additional synonyms; both, however, were quoted in the 'Systema.' The "color albus", and the term "obtusiores", were in the Linnean handwriting.

T. TEREBRA. *T. pyramidatus*, sulcis 6 acutis.

"Bonan. 3. f. 115" was in the place of the doubtful figure of Rumphius; the indicated colouring was simply "pallida": the "obsoletum" was an afterthought.

HELIX.

Testa cochleata, lævis. Apertura subrotunda segmento circuli exempto.

Except *scarabæus* and *amarula*, the members of this genus were located in the same group as in the published edition.

H. SCARABÆUS. *Morion* ovatus subanceps, labio utroque tridentato.

The "ovata, adeo" has replaced the earlier "ita", and "angulata" the original "articulata". The account of the aperture was not inserted in the manuscript, wherein "List. Hist. 577. f. 31", and "Klein 11. t. 1. f. 23", had been inserted in the Linnean handwriting.

H. LAPICIDA. *H. marginata* perforata convexa carinata.

"Cincta" was a press emendation. The only written synonym was "Faun. Suec. 1298".

H. OCLUS-CAPRI. *H. marginata* perforata subcarinata.

"Pet Gaz. t. 76. f. 6." was indicated as a synonym. The name was Latinized from the "*l'œil de bouc*" of d'Argenville, who has, however, represented an utterly different shell.

H. CAROCOLLA. *H. submarginata* imperforata carinata, labio interiore recto.

D'Argenville's figure was, evidently, not at first considered sufficiently illustrative to be referred to: it was not cited in the written copy. "Conicoplaniuscula" was the reading for "convexa", "segmento circuli" (the $\frac{1}{4}$ without any sequence was absurd) for "semiovata": the size, as usual, was not given.

H. CORNU-MILITARE. *H. marginata imperforata subcarinata, labio interiore explanato.*

The deceptive figure of Gualtieri was not at first cited.

H. CORNEA. *H. marginata convexa umbilicata, spira plana.*

"Faun. Succ. 1304" was in place of the reference to 'Lister's English Conchology,' a work apparently unknown to our author when he first drew up the Museum Catalogue. I doubt the identity of this shell (the intended name for which was *tabellaris*) with the cornea of the 'Systema.'

H. CORNU-ARIETIS. *H. utrinque depressa.*

"List. Hist. t. 136. f. 40" was written by our author in the manuscript copy.

H. AMPULLACEA. *H. subrotunda, sursum ventricosior glabra.*

The original reading of "anfractus superne ventricosi" was "abdomen superne ventricosius". The erroneous reference to Gualtieri was not at first attached to the description. The species of the Museum was evidently distinct from that of the 'Systema.'

H. GLAUCA. *H. subrotunda acuminata, labro postice marginato.*

H. CITRINA. *H. umbilicata convexa obtusa.*

The final remark was an afterthought.

H. ARBUSTORUM. *H. marginata perforata convexo-acuminata, ore suborbiculari, margine duplici, antice elongato.*

"Faun. Succ. 1295" was the only synonym; the work of Lister on English Conchology not having been at first known to Linnæus.

H. UNGULINA. *H. marginata perforata spiralis convexa, ore suborbiculato.*

The "Gualt." was a misprint for the written "Rumph."

H. LUTARIA. *H. ovata-oblonga umbilicata, interne coloratiore.*

"Habitat frequens in lutosiis fluviis, lacubus." May not the *Valvata piscinalis* be the shell intended?

H. PERVERSA. *H. ovato-oblonga subperforata glabra.*

"Pet. Gaz. t. 44. f. 7", and "Grew. Mus. t. 10. f. 9", cited in the 'Systema', were also referred to in the MS. "Alba", and "in quibusdam", were interpolations in the Linnean handwriting: *H. sulphurata* was the intended designation.

H. IANTHINA. *H. subrotunda obtusa patula diaphana.*

The entire account of this beautiful shell was written by Linnæus subsequently to the labours of his amanuensis: the twelve last printed words were not present. The cited figure of Gualtieri was not admitted, as a representation, but only alluded to in the final remark of "Confer Gualt. t. 64. f. O." "List. Hist. t. 572. f. 23", and "Sloan. Jam. 2. p. 239. t. 1. f. 4" were indicated as delineations.

H. NEMORALIS. *H.*

"Habitat ubique in Europæ nemoribus", and "Argen. t. 32. f. 8", were the unprinted additions. Lister's English Conchology was not, of course, mentioned. "Flavescens", and "nigro-purpurascens", were not in the original.

H. HÆMASTOMA. *H. imperforata subrotunda fusca fascia longitudinali subrecta alba, ore purpureo.*

H. DECOLLATA. *H. elongata lævis truncato-mutilata.*

"Pet. Gaz. t. 66. f. 1", and "Habitat in Arabia. Hasselquist. Santa Cruz. Petiv." were the unprinted additions. The entire account was in the handwriting of our author.

H. AMARULA. *Nerita edentula oblonga, anfractibus multifariam denticulatis.*

Our author was evidently puzzled as to the generic position of this peculiar-looking shell, for he has written "*Habitu accedit ad Volutas vesperitiliones, ore Helicibus, sed labium interius planum, et affinitas cum antecedenti fiat, ut hic relinquatur.*" The preceding shell alluded to was *N. corona*.

H. NERITOIDEA. *H. convexa longitudinaliter striata.*

The erroneous reference to Gualtieri was not present in the written copy.

H. PERSPICUA. *H. convexo-ovata, labio interiore nullo, apertura ad apicem usque pervia.*

The then unpublished details of both this and the preceding were referred to in the tenth edition of the 'Systema.' *Patens* was the proposed specific appellation.

H. HALIOTOIDEA. *H. depresso-planiuscula obtusissima, ore ovali dilatato.*

None of the cited figures were at first accepted by our author, who only added that of Rumphius to the earlier description, and wholly omitted the rest. "Transverse" preceded "striata".

NERITA.

Testa subrotunda, obtusa. Labium interius planum, transversim truncatum, depressum.

The generic arrangement was similar to that of the printed version.

N. CANRENA. *N. edentula umbilicata, spira mucronata, labio reflexo bifido.*

When Linnæus first described this shell, under the appellation of *N. musica*, he did not admit a single one of the cited figures as illustrative.

N. GLAUCINA. *N. edentula convexa, umbilico simplici semiclauso gibboso dicolore.*

None of the deceptive figures were at first referred to, but had been added at a subsequent period; and that of Rumphius again erased. *N. luteola* was the intended name.

N. ALBUMEN. *N. edentula subrotunda, umbilico teretiusculo.*

The present heading agrees with the subsequent details, which could not be affirmed of the printed one borrowed from the 'Systema.' The MS., in some degree, clears up the extraordinary confusion in which the Linnean species was enveloped. There were two *N. albumens* in the written copy. The shell here described (assuredly not the lobed *albumen* of the 'Systema') was originally termed *hepatica* or *luteola* (for both had been erased). The true *albumen* was described as "*edentula subrotunda, umbilico subcordato.*

labri interioris lobo explanato" and the only figure referred to was "Rumph. t. 22. f. B." "Klein 13. *Platystoma vitellum compressum*" was also mentioned. This description was suppressed, and the other species retained, with the erroneous designation, and the faulty synonymy, attached. Nor was this the only change. In order to include the *Natica vitellus* of authors ("Rumph. t. 22. f. A. *Valvata lævis prima s. vitellus*" had been quoted by our author) the "aut lutea", "aut maculis albis", had been added to the earlier description: so, likewise, had been "*Apertura rotundata, semicordata*", and "*glabrum, planiusculum, nitidum.*" I suspect, then, that whilst the ideal of the *albumen* of the 'Systema' was any hemispherical or flattened *Natica* with a labial lobe (such as *Nat. albumen, didyma, olla, &c.*), the *albumen* of the 'Museum', as printed, was composed of *Natica rufa* ("Rumph. t. 22. f. D." was quoted in the MS.) and *vitellus* (for A, not B, of Rumphius was the letter indicated in the MS.).

N. MAMMILLA. The entire account of this common shell was added in the Linnean handwriting. The inappropriate "aut lutea" was not at first present.

N. CORONA. *N. edentula, simplici spira spinosa.*

"Pet. Amb. t. 3. f. 4.", a mere copy of the Rumphian figure, was also quoted. The 19 in the reference to d'Argenville was a misprint for the written 10. *N. spinosa* was the intended designation.

N. RADULA. *N. edentula sulcata, tuberculis æqualibus.*

The *valvata granulata* of Rumphius (t. 22. f. M.) was referred to as illustrative.

N. CORNEA. *N. edentula, obsolete striata.*

N. BIDENS. *N.*

"*Obsoletis*" followed "*duobus*": the name had been written subsequent to the description.

N. VIRGINEA. *N. subedentula ovata lævis.*

"*Dentibus pluribus minutissimis*" preceded "*oris*"; "Pet. Gaz. t. 11. f. 3" was in the place of the delusive figure of d'Argenville: the variety *d* was a subsequent addition.

N. POLITA. *N. lævis, labiis dentatis.*

The *l* in the synonym of Rumphius was a misprint for the written *I*.

N. PELERONTA. *N. striata, labiis dentatis, interiore planiusculo rugoso.*

The erroneous synonym was added, along with the name *pelelronta*, to the written details: *N. rufa* was the original appellation.

N. ALBICILLA. *N. striata, labiis subdentatis, interiore tuberculato.*

N. HISTRIO. *N. sulcata, transversim striata, labio interiore dentato.*

The name, and the synonym, were added by Linnæus to the written details.

N. PLICATA. *N. sulcata, labiis profunde dentatis, interiore rotundato, exteriore utrinque dentibus acutis conicis.*

The variety alluded to was a subsequent addition. The details of the 'Museum' had been quoted, in anticipation, for this species.

N. GROSSA. *N. sulcata labiis dentatis, interiore convexo rugoso.*

N. CHAMÆLEON. *N. sulcata*, labiis dentatis, interiore rugoso tuberculato.

"Habitat in Banda", and "compositis" after "subtilissimis", are the unprinted additions.

N. UNDATA. *N. sulcata*, labiis dentatis, interiore rugoso, tuberculato.

The erroneous figure of Gualtieri was not cited when the description was drawn up, but added to the details, along with "confluentibus. *Spira acuta prominens*", when the present name was substituted for the earlier *nebulata*.

N. EXUVIA. *N. sulcata*, labiis dentatis, interiore denticulato.

HALIOTIS.

Testa univalvis, patens, convexa. *Spira* obsoleta, lateralis. Foramina lateralia pervia.

H. MIDÆ. *H. subrotunda*, utrinque nitida.

Humana was the intended specific appellation.

H. TUBERCULATA. *H. subovata*, rugis transversis tuberculatis.

The reference to Lister was an emendation.

H. STRIATA. *H. ovata*, transversim rugosa, longitudinaliter striata.

No name was attached to either this or any member of the genus, except the first.

H. VARIA. *H. ovata*, striis longitudinalibus, majoribus tuberculatis.

H. MARMORATA. *H. ovata*, striis longitudinalibus, transversis obsoletis.

H. ASININA. *H. oblonga*, extra foramina angulata, striis elevatis.

H. PARVA. *H. ovata*, angulo inter foramina et spiram.

All the headings in this genus are similar to those in the 'Systema'.

PATELLA.

Testa comica, convexa. *Spira* regularis nulla vera.

The limits of this genus were precisely those of the printed edition.

P. EQUESTRIS. *P. ungue fornicali nutante*.

P. NERITOIDEA. *P. integra ovata*, apice subspiral, labio laterali.

"Supra" preceded "convexa", and the "fere" was before "apice".

P. CHINENSIS. *P. conica latior lævis*, labio interno laterali.

This was an addition to the original catalogue.

P. PORCELLANA. *P. basi interne labiata*, pone mucronato-subspiralis.

P. CREPIDULA was not mentioned in the manuscript.

P. SACCHARINA. *P. margine sinuato, carinata, costis 7*.

"Pet, Amb. t. 3. f. 3", and "Klein 117. t. 8. f. 4", were additional synonyms: both are in the 'Systema.'

P. BARBARA. *P. dentata, costis 19 elevatis*.

P. GRANULARIS. *P. margine dentato, striis elevatis mucronibus imbricatis*.

The erroneous reference to Gualtieri was not in the original.

P. GRANATINA. *P. margine angulato, striis 11 lævibus*.

"Interius" was the earlier reading of "subtus".

P. TUBERCLATA. *P. dentata conica tuberculata, postice sima.*

Sima was the earlier name in the MS., but was erased by Linnæus.

P. LUTEA. *P. integerrima striata, vertice mucronato inflexo.*

P. UNGUIS. *P. ovali-oblonga, apice emarginata, mucrone dorsali carinato.*

Unguiformis was the intended appellation.

P. TESTUDINARIA. *P. ovata glaberrima integerrima.*

P. RUSTICA. *P. integra, striis 50 obtusiusculis.*

P. FUSCA. *P. ovata integerrima, striis elevatis, vertice obtuso.*

The intended name was *cinereo-nigricans*.

P. CRUCIATA. *P. ovalis convexa integerrima, cruce picta.*

P. RETICULATA. *P. conica compressa, superficie reticulata.*

The suggestion I have elsewhere made that this uncertain shell might prove the European *Pedicularia*, induces me to remark that, although *P. Sicula* has been supposed to be a comparatively modern discovery, Favanne had long ago delineated it in the fourth plate (f. H. 1.) of his enlarged edition of d'Argenville.

P. NIMBOSA. *P. conica ovalis, costis confertis, vertice perforato.*

The discrepancy between the heading borrowed from the 'Systema', and the after details, is removed by the substitution of the original one. The shell was termed *perforata* (not *nimbosa*), and was wrongly identified by Linnæus with the striated brown *Fissurella* of the 'Systema'.

In addition to the printed species, the two following were present in the manuscript copy.

P. SOLARIS. *P. ovata integerrima, striis subnodosis, vertice acutiusculo.*

Testa ovata, diaphana, magnitudine extimi articuli digiti, margine integerrimo, lævis, striis subtilissimis inæqualibus numerosissimis, fasciis longitudinalibus rubris albo passim maculatis. Mucro acutiusculus obliquus albidus.

This was placed in the section having a simple margin.

P. PERFOLIATA. *P. conica, reclinata, perfoliata.*

Testa magnitudine coryli nucis, conica, sed cono retro inclinato, acutissima, alba, imbricata lamellis horizontaliter testam cingentibus. Margo integer, ovalis, antrorsum gibbus s. dilatatus. Cavitas profunde glabra.

This description very fairly suits the *Patella antiquata* of the twelfth edition of the 'Systema'.

DENTALIUM.

Testa univalvis, subcylindrica, utrinque aperta. Spira regularis nulla.

Although the *Serpulæ* were intermingled, it is clear that they did not accord with the above definition.

D. ELEPHANTINUM. *D. subulatum subarcuatum, angulatum.*

The synonymy of the tenth edition was appended, Lister excepted; the erroneous 13 of the reference to the Gazophylaceum was erased. *Dens elephantis* was the proposed trivial name.

D. DENTALIS. *D. subulato-cylindricum, subarcuatum.*

The terminal details were not furnished.

D. dentalium was the intended appellation.

SERPULA.

In the original version of the 'Museum Ulricæ,' the members of this genus are not separated from the *Dentalia* (a proof, among many others, of the early date of this catalogue). Linnæus, however, when revising the transcript, had meditated the withdrawing of *S. arenaria* and *lumbri-calis*, and constituted for them a nameless genus with the following definition:—

Testa tubulosa, isthmis concamerata, dissepimentis integris, nec perforatis, s. communicantibus.

This genus would have been the equivalent of the modern *Vermetus*.

S. TRIQUETRA. *D. triquetrum, adhærens.*

The reference to Gualtieri (whose figure was somewhat uncertain, yet probably designed for *Vermilia triquetra*) was queried. The proposed name was *D. parasiticum*.

S. CONTORTUPLICATA. *D. teretiusculum, depressum, rugosum.*

There was at first no name to the description of this shell; but it was added in the handwriting of Linnæus.

S. GLOMERATA. *D. teres glomeratum.*

The 'decussato-rugosa' of the 'Systema', applicable to the '*Vermetus subcancellatus*', the shell designed in that work, was not inserted. Gualtieri's figure is that of *Vermetus glomeratus*, for the colouring of which 'alba' would be a most inappropriate term.

S. LUMBRICALIS. *D. spira divaricata teretiusculum, integrum.*

D'Arg. t. 29. f. 1. was an additional synonym.

S. ARENARIA. *D. teres rectiusculum intestiniforme.*

Despite the name borrowed from Rumphius, the *Vermetus gigas* was the object defined in the tenth edition of the 'Systema'. The absence from the manuscript of the reference to Gualtieri's drawing of that shell, and "rectiusculum" in the written diagnosis, confirms the conclusion previously arrived at, that the *Septaria arenaria* of authors was the species intended in the 'Museum Ulricæ': it was subsequently termed *S. polythalamia* by Linnæus. The delusive "subangulata" of the supposititious diagnosis was of course absent.

The *V. gigas* was probably intended by the following unpublished description.

D. INTESTINIFORME. *D. teres flexuosum intestiniforme.*

Testa rudis crassitie digiti et ultro, flexuosa vario modo in diversis, integra, intus lævis.

S. ANGUINA.

The two very dissimilar *Siliquarie* united under this appellation in the 'Museum Ulricæ,' were originally held distinct. The prickly variety was the unpublished type, and was thus defined:—

D. ANGUINUM. *D. spira inæquali angulata aculeata, sulco longitudinali perforata.*

Rumph. 125. t. 41. f. H. *Solen anguinus.*

Lang. Test. 6. *Tubulus vermicularis crista dentata.*

Testa albida, teretiuscula, angulis 9 obsoletis. Anfractus inæquales, nunc confertiores, nunc remotiores. Sulcus longitudinalis in superiore latere perforatus serie punctorum. Spinæ breves, fornicatæ ad angulos in latere inferiore.

Condensation, that peculiar faculty of the mental organization of Linnaeus, induced him to suppress this description, and attach the species, as a variety, to the form he had simultaneously characterized as

D. spira elongata, teretiusculum, inerme, fissura longitudinali.

Gault. test. 10. f. z.

To this latter the published details belong, except the expression “*pessim concatenata et quasi poris pertusa*” (which was a subsequent and fallacious addition), and the account of the variety.

S. PENIS. *D. teres, extremitate radiata disco cylindris poroso.*

“Bonan. i. f. 38.”, indicated in the tenth edition of the ‘*Systema*’, was among the synonyms. The “*Stigma, &c.*” was an addition; so too were “*lævis*,” “*tubulosis*”, and “*æqualibus*”. The term “*hemisphærico*” has replaced the earlier “*convexo*.”

In addition to the published species, the *S. Spirorbis* of the ‘*Systema*’ appears to have been indicated as

D. PLANORBE. *D. spira plana, adhærens.*

It. W. Goth. 170. *Dentalium testa spirali plana adhærente.*

Planc. Conch. 13. n. 3. *Vermiculus in littore Veneto foliis algæ adhærens.*

Testa minima, magnitudine nuper ab ovo exclusæ cochleæ, cujus formam omnino gerit, at plana omnino est, et altero latere omnino fuci foliis adhæret.

This was evidently different from the *Serpula planorbis* of the ‘*Systema*.’

Catalogue of the Dipterous Insects collected at Makassar in Celebes, by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER, Esq., F.L.S.

(Read June 2nd, 1859.)

Fam. CULICIDÆ, *Haliday.*

Gen. MEGARHINA, *Desvoidy.*

1. MEGARHINA IMMISERICORS, n. s. *Mas. Nigra, squamosa, capite thoraceque viridibus, hujus disco cupreo, proboscide palpis pedibusque purpureis, femoribus subtus fulvis, tasis intermediis albo bifas-*

ciatis, tarsis posticis albo unifasciatis, pectore argenteo, abdomine cyaneo fasciculis lateralibus albis subapicalibus nigris apicalibus auratis, alis subcinereis apud costam nigricantibus.

Male. Black. Head and thorax with green metallic scales; disc of the latter with cupreous scales. Proboscis, palpi, and legs purple; femora tawny beneath; middle tarsi with two white bands; hind tarsi with one white band. Pectus silvery. Abdomen blue, widening from the base to the tip, with small white tufts of hairs along each side; four larger black subapical tufts, two gilded apical tufts. Wings slightly greyish, blackish along the costa; veins black. Length of the body 5 lines; of the wings 8 lines.

Gen. CULEX, *Linn.*

2. *CULEX OBTURBANS*, n. s. *Fæm.* Nigricans, thoracis disco fusco, abdomine cupreo apice viridescente, gutta subapicali alba, fasciis ventralibus latis albis, pedibus subcupreo squamosis, femoribus subtus albis, alis cinereis.

Female. Blackish. Proboscis pale; its sheaths dark, longer than the thorax. Disk of the thorax with brown tomentum. Abdomen with cupreous tomentum, and with a slight greenish tinge towards the tip; a white subapical dot; underside with broad white bands. Legs with a cupreous tinge; femora whitish beneath. Wings grey; veins black, fringed. Length of the body $2\frac{3}{4}$ lines; of the wings $4\frac{1}{2}$ lines.

3. *CULEX IMPATIBILIS*, n. s. *Mas.* Subcupreo-niger, capite albo punctato, pectore albo guttato, abdomine fasciis interruptis albis, genubus albis, femoribus posticis albis apice nigris, tarsis intermediis basi albis, tarsis posticis albo bifasciatis, alis cinereis.

Male. Black, with a very slight cupreous tinge. Head with shining white points. Sheaths of the proboscis dark tawny, longer than the thorax. Pectus with shining white dots. Abdomen with interrupted shining white bands, which are most complete beneath. Knees white; hind femora white, with black tips; middle tarsi white at the base; hind tarsi with two white bands. Wings cinereous; veins black, fringed. Length of the body 2 lines; of the wings 3 lines.

4. *CULEX IMPELLENS*, n. s. *Fæm.* Fuscus, subtus testaceus, proboscide nigricante albo-fasciato, pedibus pallidis, femoribus albidis apice obscurioribus, tarsorum articulis basi albis, alis cinereis.

Female. Brown, testaceous beneath. Proboscis blackish, with a white band, a little longer than the thorax. Legs with pale reflections; femora whitish, with darker tips; joints of the tarsi white at the base. Wings grey; veins black, fringed. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. ANOPHELES, *Meigen.*

5. *ANOPHELES VANUS*, n. s. *Mas.* Cinereo-fuscus, gracilis, antennis

late plumosis, pedibus testaceis longis gracillimis, tarsorum articulis basi albis, alis subcinereis antice nigro punctatis.

Male. Cinereous brown, slender. Proboscis full half the length of the body. Palpi nearly half the length of the body. Antennæ broadly plumose. Legs testaceous, long, very slender; joints of the tarsi white at the base. Wings slightly cinereous, with black points on the fore part; veins black, fringed. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Fam. TIPULIDÆ, *Holiday.*

Gen. LIMNOBIA, *Meigen.*

The following species, in the structure of the wing-veins, does not accord with any of Meigen's divisions of the genus. The mediastinal vein ends at about three-fourths of the length of the wing; the subcostal ends at seven-eighths of the length, and is connected with the radial by a transverse veinlet at its tip; the radial, the cubital, and the 1st and the 3rd externo-medial are long and of equal length; the 2nd externo-medial springs from the 1st, at one-fourth of its length; the 3rd externo-medial is connected by a transverse veinlet near its base with the subanal.

6. LIMNOBIA IMPONENS, n. s. Ochracea, palpis antennisque nigricantibus, his thoracis dimidio brevioribus, thorace antico valde elongato et attenuato, abdomine piceo, alis subcinereis longis angustis, stigmatibus nigricante longissimo, halteribus piceis basi testaceis.

Ochraceous. Proboscis, palpi, and antennæ blackish, the latter moniliform setaceous, not half the length of the thorax. Thorax much elongated and attenuated in front. Abdomen piceous. Wings greyish, long narrow; veins black, testaceous at the base and along the costa from the base to the stigma, which is blackish and very long; halteres piceous, testaceous at the base. Length of the body 7 (?) lines; of the wings 16 lines.

Gen. TIPULA, *Linn.*

7. TIPULA INFINDENS, n. s. *Fem.* Fusca, capite apud oculos subtusque cinereo, antennis basi testaceis thorace brevioribus, thorace vittis quatuor ochraceis, abdominis apice ochraceo, pedibus fulvis longissimis, femoribus apice fuscis, alis cinereis apud costam luridis.

Female. Brown. Head cinereous about the eyes and beneath. Antennæ setaceous, submoniliform, testaceous at the base, shorter than the thorax. Thorax with a slight cinereous tinge, and with four dull ochraceous stripes. Abdomen ochraceous at the tip. Legs tawny, slender, very long; tips of the femora brown. Wings cinereous, lurid along the costa to the stigma, which is brown; veins black, tawny at the base. Length of the body 10 lines; of the wings 24 lines.

8. *TIPULA INORDINANS*, n. s. *Mas.* Fusca, capite pallide cinereo vitta fusca, antennis testaceis thorace valde longioribus, articulis basi nigris nodosis setigeris thorace vittis quatuor pallide cinereis, abdominis lateribus ventreque testaceis, segmentis basi nigro postice albo-marginatis, pedibus nigris longissimis, femoribus dimidio basali testaceis apices versus albo fasciatis, tibiis albo fasciatis, tarsis albo bifasciatis, alis hyalinis striga costali subapicali nigricante, venis transversis nigro nebulosis.

Male. Brown. Head pale cinereous, with a brown stripe. Antennæ testaceous, slightly setaceous, much longer than the thorax; joints at the base black, nodose, setigerous. Thorax with four pale cinereous stripes; pectus pale cinereous. Abdomen testaceous beneath and along each side, thickened towards the tip; segments whitish at the base, black along the hind borders. Legs black, slender, very long; femora testaceous for half the length from the base, with a white subapical band; tibiæ with a white band beyond the middle; tarsi with two broad white bands. Wings hyaline, with a blackish costal subapical streak; veins and stigma black, the latter small; transverse veins and forked subapical vein clouded with black; veins testaceous. Length of the body 9 lines; of the wings 16 lines.

Gen. CTENOPHORA, *Fabr.*

9. *CTENOPHORA INCUNCTANS*, n. s. *Mas.* Atra, capite thoraceque læte ochraceis, antennarum ramis longis æqualibus subpilosis, abdomine basi ochraceo. *Fæm.* Thoracis disco saturate ochraceo. *Var. β.* Capite thoraceque saturate ochraceis, alis albido strigatis et guttatis. Deep black. *Male.* Head and thorax bright ochraceous. Antennæ with long equal slightly pilose branches. Abdomen ochraceous at the base. *Female.* Disc of the thorax deep ochraceous. *Var.* Head and thorax deep ochraceous. Wings with five whitish streaks and two exterior elongated whitish dots. Length of the body 8-10 lines; of the wings 18-22 lines.
10. *CTENOPHORA GAUDENS*, n. s. *Mas et Fæm.* Læte ochracea, abdomine apicem versus nigro, pedibus nigris, femoribus ochraceis apice nigris, tibiis fascia basali candida, alis nigricantibus basi ochraceis, fascia exteriore albida.
- Male and Female.* Bright ochraceous. Abdomen black towards the tip. Legs black; femora ochraceous, black towards the tips; tibiæ with a snow white basal band. Wings blackish, ochraceous at the base, with a whitish exterior band which is attenuated hindward.
- Male.* Antennæ with long, equal, slightly pilose branches. Length of the body 7-10 lines; of the wings 14-16 lines.

Fam. STRATIOMIDÆ, *Haliday*.Gen. PTILOCERA, *Wied.*

- 11.
- Ptilocera smaragdina*
- .
- Walk. Dipt.*
- pt. 3. 525.

Inhabits also the Philippine Islands.

12. *PTILOCERA SMARAGDIFERA*, n. s. *Mas.* Nigra, thorace pubescente vittis duabus smaragdinis, lateribus purpurascentibus, abdomine nigricanti-cyaneo squamis lateralibus viridibus, tarsis basi obscure rufescentibus, alis subhyalinis, dimidio basali antice nigricante postice cinereo.

Male. Black. Thorax thickly pubescent, purplish along each side, with two emerald green dorsal stripes. Abdomen blackish blue, with green scales along each side. Tarsi dark reddish towards the base. Wings nearly hyaline; basal half blackish in front, cinereous hindward; veins black, yellow along the costa exteriorly. Length of the body 5 lines; of the wings 8 lines.

Gen. HERMETIA, *Latr.*

13. *HERMETIA REMITTENS*, n. s. *Mas et Fæm.* Nigra, capite antico livido, antennis basi subtus lividis apice albis, thorace vittis tribus cinereis, abdomine æneo-nigro, tibiis basi tarsisque albidis, alis nigricantibus basi subhyalinis. *Mas.* Abdominis dimidio basali livido.

Male and Female. Black. Head livid in front; a whitish line along the eye on each side of the front. Antennæ livid beneath towards the base; apical joint elongate-fusiform, white at the tip, as long as all the other joints together. Thorax with 3 indistinct cinereous stripes. Abdomen slightly bronzed, livid for half the length from the base in the male. Tibiæ at the base and tarsi whitish. Wings blackish, nearly hyaline at the base; halteres livid. Length of the body 78 lines; of the wings 12-14 lines.

Gen. STRATIOMYS, *Geoffr.*

14. *STRATIOMYS IMMISCENS*, n. s. *Mas.* Nigra, antennis fulvis parvis, scutelli margine postico spinisque pallide flavis, abdomine pallide flavo fasciis tribus dorsalibus latis nigris postice excavatis, pedibus flavescentibus, femoribus tibiisque nigro fasciatis, tarsis nigris, alis limpidis.

Male. Black. Head beneath and thorax with whitish down. Antennæ tawny, short. Scutellum along the hind border and spines pale yellow. Abdomen pale yellow, with three broad black dorsal bands, whose hind borders are much indented. Legs yellowish; femora and tibiæ with black bands; tarsi black. Wings limpid; veins brown; halteres pale. Length of the body 6 lines; of the wings 10 lines.

15. *STRATIOMYS FINALIS*, n. s. *Fæm.* Nigra, aureo-tomentosa, capite

subtus fulvo, antennis fulvis parvis, thorace vittis tribus nigris, thoracis margine postico spinisque pallide flavis, abdomine fulvo, pedibus pallide fulvis, alis limpidis.

Female. Black with gilded tomentum. Head tawny beneath, with two more or less tawny calli above the antennæ, which are tawny and short. Thorax with three black stripes; scutellum with the hind border and the spines pale yellow. Abdomen tawny, paler beneath. Legs pale tawny. Wings limpid; veins tawny; stigma testaceous. Length of the body 4 lines; of the wings 8 lines.

Gen. CLITELLARIA, *Meigen*.

16. CLITELLARIA FESTINANS, n. s. *Mas.* Nigra, aureo-tomentosa, antennis rufescenti-fulvis apices versus nigris, thorace fascia vittisque duabus aureis, scutelli spinis apice rufescenti-fulvis, abdomine vittis tribus macularibus aureis, pedibus luteis, alis luteis postice cinereis apice nigricantibus.

Male. Black, thick, with gilded down. Antennæ nearly as long as the breadth of the head; scape reddish tawny, fusiform, longer than the flagellum, which is black and lanceolate. Thorax and pectus with an interrupted downy band; thorax with two downy stripes, and with two lateral black spines; scutellum with a downy border, and with two stout spines, whose tips are reddish tawny. Abdomen with three rows of downy spots; the middle spots triangular; the lateral spots oblique. Legs and halteres luteous. Wings luteous along the costa, cinereous hindward, where the veins are bordered with black; tips broadly blackish; a black dot adjoining the luteous stigma. Length of the body 6 lines; of the wings 12 lines.

Fem.? Nigra, cinereo-tomentosa, antennis scapo intus fulvo, thoracis vittis duabus abdominisque maculis cinereis, femoribus tibiisque albidis apices versus nigris, tarsis basi albidis, alis obscure cinereis fascia lata subapicali nigricante.

Female? Black. Head shining, with white tomentum about the eyes. Antennæ shorter than the breadth of the head; scape linear, tawny on the inner side, much shorter than the flagellum, which is lanceolate. Thorax with two stripes of cinereous tomentum and with two lateral spines; scutellum with two stout spines; pectus with silvery cinereous tomentum. Abdomen with cinereous tomentose spots, which are disposed in three rows. Femora and tibiæ whitish black towards the tips; tarsi whitish at the base. Wings dark grey, with a broad blackish subapical band; veins and stigma black; halteres whitish. Length of the body 5 lines; of the wings 10 lines.

17. CLITELLARIA GAVISA, n. s. *Mas.* Nigra, albido-tomentosa, antennis testaceis apices versus nigris, thorace vittis duabus aureis, scutelli spinis apice flavis, abdomine vittis tribus macularibus aureis, pedibus flavis apices versus nigricantibus.

Male. Black, with whitish down. Antennæ shorter than the breadth of the head; scape testaceous, longer than the flagellum, which is

pilose. Thorax with two stripes of gilded tomentum, and with two lateral spines; spines of the scutellum yellow towards their tips. Abdomen with three rows of gilded tomentose spots, the dorsal spots triangular; the lateral spots oblique. Legs yellow; tarsi black towards the tips. Wings cinereous, blackish towards the tips and about the transverse veins; veins black, yellow towards the base; halteres yellow. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Fæm.? Cinereo-tomentosa, thoracis vittis abdominisque maculis cinereis, pedibus albidis, femoribus tibiis tarsisque apice nigris alis cinereis, fascia subapicali nigricante.

Female? With cinereous tomentum. Head white and shining about the eyes. Stripes of the thorax and spots of the abdomen cinereous. Legs whitish; femora, tibiæ and tarsi black towards the tips. Wings cinereous with a blackish subapical band.

Gen. OXYCERA, *Meig.*

18. OXYCERA MANENS, n. s. *Mas et Fæm.* Nigra, cinereo-subtomentosa, antennis fulvis, pedibus pallide fulvescentibus aut lividis, alis vix cinereis. *Mas.* Thorace aureo-subtomentoso.

Male and Female. Black, slightly covered with cinereous tomentum. Head white and shining about the eyes. Antennæ tawny. Thorax of the male slightly covered with gilded tomentum. Legs dull pale tawny or livid; hind tibiæ black. Wings hardly cinereous; veins and stigma pale in the male, black in the female. Length of the body 3 lines; of the wings 7 lines.

Gen. SARGUS, *Fabr.*

19. SARGUS REPENSANS, n. s. *Mas.* Testaceus, pubescens, vertice nigro, palpis lanceolatis, arista nigra, tibiis tarsisque posticis nigris, his albo cinctis, tarsis anterioribus apice nigris, alis cinereis apices versus nigricantibus.

Allied to *S. AURIFER.*

Male. Testaceous, pubescent. Vertex black. Palpi lanceolate, extending along two-thirds of the space between the mouth and the antennæ; arista black. Hind tibiæ and hind tarsi black, the latter white towards the tips, which are black; anterior tarsi with black tips. Wings cinereous, blackish towards the tips; veins black, testaceous at the base. Length of the body 9 lines; of the wings 20 lines.

20. SARGUS REMEANS, n. s. *Fæm.* Niger, pubescens, thorace purpurascente-nigro, vittis duabus lateralibus pectoris disco tibiisque anterioribus supra sordidè albidis, alis nigricantibus. *Mas.*? Antennis piceis, thorace purpurascente-cupreo, pectore livido, abdominis segmentis albido-marginatis, alis fuscis, cinereis extus albido-stri-gatis.

Allied to *S. TENEBRIFER.*

Female. Black, pubescent. Head wanting. Thorax purplish black, with a dingy whitish stripe along each side; disk of the pectus dingy whitish. Anterior tibiæ dingy whitish above. Wings blackish; veins black; halteres dingy whitish, with blackish knobs. Length of the body 9 lines; of the wings 20 lines.

Male? Black. Head whitish about the mouth. Antennæ piceous. Thorax purplish cupreous, with a dingy whitish stripe along each side; pectus livid. Abdomen with two lanceolate apical appendages; hind borders of the segments whitish. Wings brownish cinereous, with slight whitish streaks on the exterior areolets. Length of the body 7 lines; of the wings 16 lines.

21. *SARGUS REDHIBENS*, n. s. *Fæm.* Cyaneus, antennis fulvis, thoracis lateribus anticis purpurascentibus, abdomine purpureo, pedibus albidis, tibiis posticis femoribusque nigricante strigatis, alis cinereis. *Var. β.* Vertice purpureo, thorace viridi.

Female. Blue. Antennæ tawny. Thorax purplish on each side in front. Abdomen purple, much broader than the thorax. Legs whitish; femora with a blackish streak above towards the tips; hind tibiæ with a blackish apical streak. Wings cinereous; veins black; stigma blackish. Halteres tawny. *Var. β.* Vertex purple. Thorax green. Length of the body $3\frac{1}{2}$ –4 lines; of the wings 7–9 lines.

This may be a local variety of *S. metallinus*, but differs from that species by the dark marks on its hind legs, and by the wing-veins being black at the base.

22. *SARGUS MACTANS*, n. s. *Fæm.* Cupreo-viridis, abdomine cupreo, pedibus testaceis, tibiis posticis basi nigris, alis cinereis apices versus obscurioribus.

Female. Cupreous green, with cinereous down. Head wanting. Abdomen cupreous. Legs testaceous; hind tibiæ black for half the length from the base. Wings cinereous, darker from the discal areolet to the tips; veins black; stigma brown; halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 10 lines.

23. *SARGUS INACTUS*, n. s. *Mas.* Albido-testaceus, vertice nigro, thoracis disco scutellique apice purpureis, pectore maculis duabus cupreis, alis cinereis.

Male. Whitish testaceous. Vertex black. Disk of the thorax and scutellum towards the tip purple; pectus with a cupreous spot on each side. Wings cinereous; veins black; stigma dark brown; discal areolet shorter than that of the two preceding species. Length of the body 5? lines; of the wings 10 lines.

Gen. NERNA, Walk.

24. *NERNA IMPENDENS*, n. s. *Mas et Fæm.* Nigra, cinereo-subtomentosa, antennis tarsis posterioribus halteribusque testaceis, tarssi

anticiis tibiisque piceis, alis cinereis apud costam anteriorem nigricantibus.

Male and Female. Black, with very slight cinereous pubescence. Antennæ, posterior tarsi, and halteres testaceous; tibiæ and fore tarsi piceous. Wings cinereous, blackish along the exterior part of the costa; veins and stigma black. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. SOLVA, n. g.

Corpus lineare. *Proboscis* lanceolata. *Palpi* porrecti, lineares, caput non superantes. *Antennæ* lanceolatae. *Scutellum* inerme. *Abdomen* thorace longius. *Pedes* breviusculi, femoribus posticis incrassatis subserratis. *Alæ* sat angustæ.

Body linear. Head not broader than the thorax. Proboscis lanceolate. Palpi porrect, linear, rounded at the tips, not extending beyond the head. Antennæ lanceolate, shorter than the breadth of the head; joints indistinct. Thorax with a humeral callus and a linear callus on each side. Scutellum unarmed. Abdomen rather longer than the thorax. Legs rather short; hind femora incrassated, minutely serrated beneath; hind tibiæ very slightly curved, applied to the femora. Wings rather narrow; 1st and 2nd cubital veins rather long; length of the discal areolet more than thrice its breadth; 3rd and 4th externo-medial veins connected towards the border; anal and subanal veins connected at some distance from the border.

25. SOLVA INAMENA, n. s. *Fem.* Cinereo-nigra, palpis, thoracis callis, scutello, abdominis lateribus, ventre pedibusque testaceis, antennis testaceis apice nigris, abdominis segmentis testaceo marginatis, alis subcinereis.

Female. Cinereous black. Mouth, palpi, calli of the thorax, scutellum, abdomen beneath and along each side except at the base, legs, and halteres testaceous. Antennæ testaceous except towards the tips. Hind borders of the abdominal segments testaceous. Wings greyish; veins black, testaceous towards the base. Length of the body $2\frac{1}{2}$ –3 lines; of the wings 5–6 lines.

Gen. AMPSALIS, n. g.

Fem. *Corpus* elongatum, sublineare. *Antennæ* filiformes; flagellum lineare. *Thorax* longi-ellipticus; scutellum bispinosum. *Abdomen* ellipticum, thorace paullo latius non longius. *Pedes* longiusculi. *Alæ* angustæ.

Female. Body elongate, nearly linear. Head a little broader than the thorax. Eyes prominent. Palpi very short. Antennæ filiform, much longer than the breadth of the head; flagellum linear, about twice the length of the scape; joints indistinct. Thorax elongate-elliptical; scutellum armed with two obliquely ascending spines. Abdomen

elliptical, a little broader but not longer than the thorax. Legs rather long. Wings narrow; 1st cubital vein about one-fourth the length of the 2nd; four externo-medial veins complete; subanal vein curved, joining the anal vein at some distance from the border; discal areolet elongated and attenuated exteriorly; exterior side very short.

26. *AMPSALIS GENIATA*, n. s. *Fæm.* Ferrugineo-fusca, antennis nigris basi fulvis, thorace vittis duabus testaceis, scutello testaceo, apice spinisque et pectoris disco nigris, abdomine nigro, basi vittis duabus interruptis lateralibus pedibusque testaceis, alis cinereis apices versus fusciscentibus.

Female. Ferruginous brown. Antennæ black, tawny towards the base. Thorax with two testaceous stripes; scutellum testaceous; tip and spines black. Disk of the pectus black. Abdomen black; base and an interrupted stripe along each side testaceous. Legs and halteres testaceous. Wings grey, brownish in front towards the tips; veins black, testaceous at the base; stigma testaceous. Length of the body 6 lines; of the wings 11 lines.

Gen. *TRACANA*, n. g.

Mas et Fæm. *Corpus* elongatum. *Proboscis* lanceolata. *Antennæ* graciles, filiformes, capite transverso vix breviores. *Thorax* longi-ellipticus; scutellum bispinosum. *Abdomen* thorace paullo longius et latius. *Pedes* longiusculi. *Alæ* longæ, non latæ.

Male and Female. Body elongate. Head rather broader than the fore part of the thorax. Mouth lanceolate; palpi very short. Antennæ slender, filiform, about as long as the breadth of the head; 3rd joint long; 4th and following joints shorter. Thorax elongate-elliptical, with a distinct linear callus along each side; scutellum armed with two obliquely ascending spines. Abdomen elongate-elliptical, most attenuated towards the base, a little broader and longer than the thorax. Legs rather long. Wings long, not broad; 1st subcubital vein hardly one-third the length of the 2nd; four externo-medial veins complete; subanal vein curved, joining the anal vein near the border; discal areolet oblong, narrower exteriorly; exterior side very short.

27. *TRACANA ITERABILIS*, n. s. *Mas et Fæm.* Cinereo-nigra, capite antico fulvo, antennis albido-flavis basi nigricantibus, pedibus fulvis, tibiis posticis femoribusque nigro-fuscatis, alis cinereis apices versus nigricantibus. *Mas.* Abdomine fulvo maculis lateralibus nigris. *Fem.* Abdominis basi lateribusque fulvis.

Male and Female. Cinereous black. Head in front and calli of the thorax tawny. Antennæ whitish yellow, blackish at the base. Legs tawny; femora and hind tibiæ banded with black. Wings grey, blackish towards the tips; veins black; halteres tawny. *Male.* Abdomen tawny, with some black spots on each side. *Female.* Abdomen tawny

at the base and along each side. Length of the body 5 lines; of the wings 10 lines.

Gen. ROSAPHA, n. g.

Mas et Fæm. Corpus angustum, elongatum, lineare. *Antennæ* graciles, filiformes, capite transverso longiores; articulus 3^{us} fusiformis. *Scutellum* spinis duabus longis acutis armatum. *Abdomen* thorace vix longius aut latius. *Pedes* breves. *Alæ* angustæ.

Male and Female. Body narrow, elongated, linear. Mouth and palpi extremely short. *Antennæ* slender, filiform, longer than the breadth of the head; 3rd joint long, fusiform; joints of the flagellum indistinct. Thorax nearly linear, a little narrower in front; scutellum armed with two long, acute, hardly ascending spines. Abdomen subfusiform, narrowest towards the base, very little broader and longer than the thorax. Legs short. Wings narrow; 1st cubital vein nearly half the length of the 2nd; three complete externo-medial veins; subanal vein curved, joining the anal vein at some little distance from the border; discal areolet oblong; exterior side short.

28. ROSAPHA HABILIS, n. s. *Mas et Fæm.* Fulva, capite antennisque nigris, his basi fulvis, thoracis macula antica elongata, spinis apice, tibiis posticis apices versus tarsisque anterioribus nigris, tarsis posticis albis apice nigris, alis cinerascens apices versus nigris. *Fæm.* Abdomine supra nigro, basi lateribusque fulvis.

Male and Female. Tawny. Head black, white beneath along the eyes. *Antennæ* black; 1st, 2nd, and 3rd joints tawny. Thorax with an elongated black spot in front; spines of the scutellum black towards the tips. Hind tibiæ towards the tips and anterior tarsi black; hind tarsi white with black tips. Wings greyish, blackish in front towards the tips; veins black, tawny at the base; stigma ferruginous brown. *Female.* Abdomen black above, except at the base and along each side. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Gen. RUBA, n. g.

Fæm. Corpus breve, crassum, latum. Caput parvum. *Antennæ* capite transverso vix breviores. *Scutellum* inerme. *Abdomen* globosum, thorace valde latius. *Pedes* breves. *Alæ* mediocres.

Female. Body thick, short, broad. Head much narrower than the thorax. Proboscis and palpi very short. *Antennæ* nearly as long as the breadth of the head; 3rd joint broader and longer than the flagellum, of which the joints are short, compact, and minutely setulose. Thorax a little longer than broad; scutellum unarmed. Abdomen globose, very much broader and a little longer than the thorax. Legs short. Wings moderately broad; 1st cubital vein not one-third of the length of the 2nd; four complete externo-medial veins; subanal

vein curved, joining the anal vein at some distance from the border ; discal areolet elongated exteriorly, irregularly triangular ; exterior side very short.

29. *RUBA INFLATA*, n. s. *Mas.* Testacea, valde pubescens, capite subtus guttis duabus nigris, alis sub-cinereis apices versus fusciscentibus, stigmatibus flavescente.

Male. Testaceous. Head with a black dot on each side of the mouth. Flagellum of the antennæ black. Thorax and abdomen very pubescent. Wings slightly greyish, brownish towards the tips, and especially so in front ; veins black, testaceous at the base ; stigma yellowish. Length of the body 4 lines ; of the wings 7 lines.

Gen. *TINDA*, n. g.

Fæm. Corpus longiusculum, depressum. Caput oblongum, margine postico elevato. Antennæ capite transverso vix breviores ; articulus 3^{us} fusiformis ; flagellum compressum, lanceolatum. Scutellum spinosum. Abdomen ellipticum, thorace latius non longius. Pedes breves, graciles. Alæ angustæ.

Female. Body somewhat elongated and depressed. Head somewhat oblong ; eyes nearly contiguous in front, diverging hindward, where there is an elevated margin. Mouth and palpi very short. Antennæ nearly as long as the breadth of the head ; 3rd joint fusiform, fully half the length of the flagellum, which is compressed and lanceolate, and with indistinct joints. Thorax slightly widening hindward ; scutellum with six ? very minute spines. Abdomen elliptical, broader but not longer than the thorax. Legs short, slender. Wings narrow ; 1st cubital vein less than one-third the length of the 2nd ; three complete externo-medial veins ; subanal vein joining the anal vein at some distance from the border ; discal areolet elongated, its exterior side very short.

30. *TINDA MODIFERA*, n. s. *Fæm.* Nigra, antennis basi testaceis, pedibus testaceis, femoribus posterioribus supra obscurioribus, alis cinereis costam versus subnigricantibus.

Female. Black, hardly shining. Antennæ testaceous towards the base. Legs testaceous ; posterior femora somewhat darker above, except towards the base. Wings grey, slightly blackish along most of the costa ; veins black ; halteres testaceous. Length of the body 3 lines ; of the wings 5 lines.

Gen. *SARUGA*, n. g.

Mas. Corpus contractum, breve, latum, crassum. Vertex gibbosus. Oculi magni. Antennæ brevissimæ ; articulus 3^{us} rotundus ; arista apicalis, gracillima. Thorax gibbosus ; scutellum elevatum, conicum, postice productum. Abdomen transversum, thorace brevius. Pedes breves, graciles, simplices. Alæ breviusculæ.

Male. Body contracted, short, broad, thick. Head almost as broad as the thorax; vertex gibbous; eyes large, bare; mouth extremely short and small; antennæ very short, 3rd joint round; arista apical, very slender, a little longer than the antennæ; thorax gibbous; scutellum very gibbous, forming an upright cone, somewhat gibbous and conical hindward, where it is horizontal; abdomen a little broader than long, much shorter than the thorax; legs short, slender, simple; wings rather short; veins in structure like those of *Oxycera*.

31. *SARUGA CONIFERA*, n. s. *Mas.* Anthracina, antennis pedibusque albido-testaceis, thorace maculis duabus magnis flavo-tomentosis, femoribus nigris, genibus fulvis, alis albidis.

Male. Coal-black; antennæ and legs whitish testaceous; thorax with a large yellow tomentose spot on each side in front of the scutellum; femora black; knees tawny; wings whitish vitreous; veins and stigma whitish testaceous, the former black towards the base. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Fam. TABANIDÆ, *Leach*.

Gen. TABANUS, *Linn*.

32. *TABANUS SUCCURVUS*, n. s. *Fam.* Nigricanti-fuscus, capite ferrugineo, callo longo lanceolato gracillimo, palpis piceis, antennis nigris, segmentorum abdominalium marginibus posticis subpallidioribus, tibiis subtus rufescenti-piceis, alis obscure cinereis apud venas fuscescentibus.

Female. Blackish brown. Head ferruginous, with a long lanceolate and very slender callus between the nearly contiguous eyes; under side clothed with black hairs. Proboscis black. Palpi piceous. Antennæ black; 3rd joint with a small horn. Hind borders of the abdominal segments slightly paler in the middle. Tibiæ reddish piceous beneath. Wings dark grey, brownish about the veins towards the base; veins black, piceous towards the base; fore branch of the cubital vein simple, nearly straight; halteres ferruginous, with luteous knobs. Length of the body 11 lines; of the wings 22 lines.

33. *TABANUS FACTIOSUS*, n. s. *Fam.* Nigricanti-fuscus, capite testaceo, callo nigro gracili lanceolato, palpis piceis, thorace cinereo, abdomine rufescenti-piceo, maculis dorsalibus trigonis albidis, segmentorum ventralium marginibus posticis testaceis.

Female. Blackish brown. Head with testaceous tomentum and with a slender lanceolate black callus between the eyes. Proboscis black; palpi piceous. Antennæ with a very small horn. Thorax with cinereous down; pectus paler and more thickly clothed with paler down. Abdomen reddish piceous, with a whitish triangular spot on the hind border of each segment; hind borders of the ventral segments testaceous. Legs piceous; femora black; tibiæ tawny beneath. Wings grey, with a brownish tint in front; veins black, ferruginous towards

the base; fore branch of the cubital vein simple, nearly straight; halteres ferruginous, with whitish-yellow knobs. Length of the body 10 lines; of the wings 22 lines.

34. *TABANUS REDUCENS*, n. s. *Fæm.* Cinereo-niger, capite albido, callo nigro longo clavato, palpis albidis, antennis nigris vix dentatis, thorace vittis quatuor cinereis, abdomine vittis tribus albidis, segmentis ventralibus albido marginatis, tibiis fulvis apice nigris, alis cinereis striga subcostali nigricante, halteribus piceis apice testaceis.

Female. Cinereous black. Head whitish, clothed with white hairs beneath; callus black, long, clavate; palpi whitish; antennæ black, with an extremely small tooth; thorax with four cinereous stripes; pectus cinereous; abdomen with three whitish stripes, the dorsal one much more conspicuous than the lateral pair; hind borders of the ventral segments whitish; tibiæ tawny with black tips. Wings cinereous, with a blackish sub-costal streak; veins black; fore branch of the cubital vein simple, nearly straight; halteres piceous, with luteous knobs. Length of the body 10 lines; of the wings 20 lines.

35. *TABANUS SPOLIATUS*, n. s. *Mas.* Cinereo-niger, albido tomentosus, capite cinereo, palpis testaceis, antennis nigris basi rufescentibus vix dentatis, thoracis lateribus fulvescentibus, abdomine rufescente maculis dorsalibus trigonis albidis, segmentis ventralibus albido marginatis, tibiis rufescentibus nigro lineatis, alis cinereis apud costam fusciscentibus, halteribus albidis.

Allied to *T. UNIVENTRIS* and to *T. INTERNUS*, but distinct.

This may prove to be the male of *T. reducens*, though it is very different in appearance. *Male.* Cinereous black, with whitish tomentum, which is visible when viewed horizontally; head cinereous; palpi testaceous, very short; antennæ black, reddish at the base, with an extremely small tooth; thorax dull-tawny along each side; abdomen reddish, with a small triangular whitish spot on the hind border of each segment; hind borders of the ventral segments whitish; tibiæ reddish with a black line; wings cinereous, brownish along the costa; veins black, ferruginous at the base; fore branch of the cubital vein simple, nearly straight; halteres whitish. Length of the body 9 lines; of the wings 16 lines.

36. *TABANUS IMMIXTUS*, n. s. *Fæm.* Cinereo-niger, capite albido, callo nigro longo angusto sublineari, palpis albidis, antennis nigris basi rufis vix dentatis, abdomine ferrugineo apice nigro maculis trigonis marginibusque posticis testaceis, tibiis fulvis, alis cinereis apud costam subluridis, halteribus testaceis.

Female. Cinereous black; head whitish; callus long, black, slender, nearly linear; palpi whitish; antennæ black, red at the base; tooth extremely small and obtuse; abdomen ferruginous, black towards the tip; each segment with a triangular spot and the hind border testaceous; tibiæ tawny; wings cinereous, slightly lurid along the costa;

veins black, ferruginous at the base; halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

37. *TABANUS FLEXILIS*, n. s. *Fam.* Cinereus, testaceo tomentosus, callo nigro longo gracillimo, palpis testaceis, antennis ochraceis subdentatis apice nigris, abdomine ferrugineo fusco maculis dorsalibus trigonis marginibusque posticis testaceis, tibiis basi fulvis, alis cinereis apud costam subluridis fusco bifasciatis, halteribus testaceis apice albis.

Female. Cinereous, with testaceous tomentum; head with a black, long, extremely slender callus; palpi testaceous; antennæ ochraceous, with black tips and with a very small black tooth; pectus whitish; abdomen ferruginous brown; each segment with a large triangular spot and with the hind border testaceous; tibiæ tawny towards the base; wings cinereous, somewhat lurid along the costa, with two irregular brown bands; 1st band short, discal, 2nd abbreviated hindward; veins black, ferruginous at the base; fore branch of the cubital vein simple, nearly straight; halteres testaceous with white tips. Length of the body 8 lines; of the wings 16 lines.

Gen. *CHRYSOPS*, *Meigen*.

38. *CHRYSOPS FASCIATUS*, *Wied.* See Vol. I. p. 112.

Fam. *ASILIDÆ*, *Leach*.

Subfam. *MYDASITES*, *Walk.*

Gen. *MYDAS*, *Fabr.*

39. *MYDAS BASIFASCIA*, n. s. *Fam.* Atra, antennis clavatis, abdomine fascia basali fláva apice nitente, femoribus tibiisque posticis rufescentibus, alis cinereis apud venas ochraceis.

Female. Deep black; antennæ clavate, a little longer than the breadth of the head; abdomen with a slender yellow band very near the base, shining at the tip; hind femora and hind tibiæ reddish; wings cinereous, ochraceous about the veins, which are also ochraceous. Length of the body 12 lines; of the wings 22 lines.

Subfam. *DASYPOGONITES*, *Walk.*

Gen. *DISCOCEPHALA*, *Macquart*.

40. *DISCOCEPHALA PANDENS*, n. s. *Mas.* Picea, proboscide palpisque nigris, pectore thoracisque lateribus albidis, abdomine subtus pallide cinereo maculis lateralibus nigris, pedibus fulvis, genibus nigris, tarsis piceis, alis fusciscentibus cinereo strigatis et marginatis, halteribus albidis. *Fam.* Abdomine fulvo, alis cinereis.

Male. Piceous; front facets of the eyes large; proboscis and palpi black; mystax with four bristles; pectus and sides of the thorax whitish; abdomen beneath pale-cinereous, with black shining spots along each side; legs tawny; trochanters and knees black; tarsi piceous; wings

brownish, cinereous along the hind border, and with cinereous streaks in the disks of the areolets; halteres whitish. *Female*. Abdomen and halteres tawny; wings cinereous. Length of the body 4-5 lines; of the wings 10-12 lines.

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

41. LAPHRIA CONCLUDENS, n. s. *Fæm.* Aurata, capite pilis flavis, antennis flavis articulo 3° rufescente fusiformi, thorace vittis tribus nigris, abdomine fulvo lituris duabus fasciaque interrupta fasciisque duabus ventralibus nigris, pedibus fulvis, alis cinereis apud apices nigricantibus, halteribus pallide flavis.

Female. Gilded; head clothed with pale-yellow hairs; mystax with several bristles; proboscis linear, tawny; antennæ yellow; 3rd joint reddish, elongate fusiform; thorax with 3 black stripes, the lateral pair abbreviated; abdomen tawny; 4th and 5th ventral segments with black bands; 4th dorsal segment with a slight black mark on each side; 5th with a widely interrupted black band; legs tawny; wings cinereous, blackish towards the tips; veins black, ferruginous towards the base; halteres pale yellow. Length of the body 11 lines; of the wings 20 lines.

42. LAPHRIA VULCANUS, *Wied.* See Vol. I. p. 10.

43. LAPHRIA TAPHIUS, *Walk. Cat. Dipt.* pt. 2, 380.

Inhabits also the Philippine Islands.

44. LAPHRIA REQUISITA, n. s. *Mas et Fæm.* Viridis, capite aurato, antennarum articulo 3° longi-fusiformi, femoribus posticis incrassatis, alis nigricantibus basi et apud costam cinereis, halteribus testaceis. *Mas.* Femoribus anterioribus incrassatis, halteribus ex parte nigricantibus. *Fæm.* Abdomine purpurascenti-cyaneo basi viridi.

Male and Female. Green; head gilded in front, with whitish hairs beneath; mystax with a few black bristles; third joint of the antennæ elongate-fusiform; hind femora incrassated. Wings blackish, cinereous near the base and along nearly half the length of the costa; veins black; halteres testaceous. *Male*. Anterior femora incrassated; halteres partly blackish. *Female*. Abdomen purplish blue, green towards the base. Length of the body 7-9 lines; of the wings 14-16 lines.

45. LAPHRIA PARTITA, n. s. *Mas.* Nigra, capite aurato, antennarum articulo 3° sublineari, thorace lineis tribus cinereis, lateribus ochraceopilosis, maculis duabus humeralibus testaceis, abdomine apice cyanescenti-nigro dimidio basali ochraceo-piloso, pedibus aurato-pilosis, femoribus incrassatis, alis nigricantibus dimidio basali fere sublimpido, halteribus testaceis. *Fæm.* Antennarum articulo 3° longi-fusiformi,

maculis duabus humeralibus albidis, abdomine nigricanti-cupreo, dimidio basali cinereo piloso.

- Male.* Black; head brightly gilded above, clothed with luteous hairs beneath; mystax with some black bristles; 3rd joint of the antennæ nearly linear, conical at the tip, a little longer than the 1st and the 2nd together; thorax with three slender cinereous lines; sides with ochraceous hairs; two humeral testaceous spots; abdomen bluish-black towards the tip; 1st, 2nd, and 3rd segments with ochraceous hairs; legs with gilded hairs and with black bristles; femora incrassated, especially the hind pair; wings blackish, almost limpid for nearly half the length from the base, which is partly blackish; the blackish part emitting some streaks into the limpid part; veins black; halteres testaceous.
- Female.* Third joint of the antennæ elongate fusiform; two humeral whitish spots; 1st, 2nd, and 3rd abdominal segments with cinereous hairs; following segments blackish cupreous. Length of the body 7-9 lines; of the wings 14-16 lines.

46. *LAPHRIA COMPLENS*, n. s. *Fæm.* Nigra, capite argenteo, antennarum articulo 3^o fusiformi, thorace strigis duabus anticis obliquis maculisque duabus pectoralibus argenteis, abdomine purpureo maculis duabus argenteis, pedibus purpurascenti-nigris, femoribus non incrassatis, alis nigricantibus, halteribus apice testaceis.

Female. Black; head silvery, with black hairs beneath; mystax with several black bristles; third joint of the antennæ fusiform; thorax with an oblique silvery streak on each side in front; pectus with a silvery spot on each side; abdomen purple, with a silvery spot on each side of the 4th segment; legs purplish-black; femora not incrassated; wings blackish; veins black; discal veinlet and third externo-medial vein nearly forming one straight line; halteres with testaceous knobs. Length of the body 7 lines; of the wings 12 lines.

47. *LAPHRIA DIOCTRIOIDES*, n. s. *Fæm.* Nigra, tenuis, linearis, facie pectoreque argenteis, antennis linearibus, abdomine maculis lateralibus pedibusque fulvis, femoribus posticis nigro fasciatis, tibiis tarsisque posticis nigris, alis cinereis, halteribus pallide flavis.

Female. Black, slender, linear; face silvery; mystax with four black bristles; antennæ slender, linear, nearly as long as the breadth of the head; pectus silvery; abdomen with tawny dots along each side; legs tawny; a black ring on each hind trochanter; hind femora with a black band; hind tibiæ and hind tarsi black, the latter tawny beneath; wings cinereous; veins black; halteres pale yellow. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Subfam. ASILITES, *Walk.*

Gen. TRUPANEA, *Macq.*

48. *TRUPANEA STRENUA*, n. s. *Fæm.* Nigra, robusta, capite fuscescenti-cinereo, pilis subtus flavescenti-cinereis, abdomine fuscescenti-

nigro fascia basali fasciculari alba apice nigro nitente, pedibus crassis, alis fusciscentibus vitta sordide albida, halteribus fulvis.

Female. Black, stout; head brownish cinereous, very thickly clothed beneath with yellowish cinereous hairs; epistoma very prominent; mystax with a few black bristles above and with many yellowish cinereous bristles below; palpi with short black bristles; 3rd joint of the antennæ elongate conical; thorax with black bristles hindward and along each side; pectus cinereous; abdomen brownish black, with a basal band of white tufts; tip black, shining; legs very stout; pulvilli reddish; wings brownish; radial areolet with a dingy whitish stripe; veins black; halteres tawny. Length of the body 11 lines; of the wings 22 lines.

49. *TRUPANEA CALORIFICA*, n. s. *Mas et Fæm.* Ochracea, capite aurato, antennis nigris, thorace vittato, abdomine maculis magnis transversis subquadratis nigris, pedibus rufis crassis, tarsis nigris, alis cinereis vitta sordide albida, halteribus fulvis. *Mas.* Pectore abdomineque cinereis, hujus fasciculo subapicali argenteo. *Fæm.* Pectore testaceo, abdomine fulvo.

Male and Female. Ochraceous; head gilded in front, thickly clothed beneath; epistoma prominent; mystax with numerous gilded bristles and above with a few black bristles; palpi with short black bristles; antennæ black; third joint fusiform; thorax with slender indistinct stripes; abdomen with a large black transverse subquadrate spot on each segment; legs red, very stout; tarsi black; wings cinereous; radial areolet with a dingy whitish stripe; veins black; halteres tawny.

Male. Head with whitish hairs beneath; pectus and abdomen cinereous, the latter with a silvery-white subapical tuft. *Female.* Head with gilded hairs beneath; pectus testaceous; abdomen tawny. Length of the body 9-11 lines; of the wings 18-20 lines.

Gen. *ASILUS*, Linn.

50. *ASILUS DETERMINATUS*, n. s. *Mas et Fæm.* Cinereo-niger, capite subaurato, antennis nigris, thorace vittis tribus cinereis, pedibus fulvis robustis, femoribus nigro vittatis, tibiis apice tarsisque nigris, alis fuscis, halteribus testaceis. *Mas.* Abdomine pilis basalibus luteis. *Fæm.* Abdomine pilis basalibus cinereis dimidio apicali stylato.

Male and Female. Cinereous black; head slightly gilded in front, with pale hairs beneath; epistoma not prominent; mystax with many pale, and above with a few black bristles; antennæ black; third joint lanceolate; arista nearly as long as all the preceding joints; thorax with three cinereous stripes, the lateral pair dilated towards the humerus on each side; pectus cinereous; legs tawny, stout; femora striped above with black; tarsi and tips of the tibiæ black; wings brown; veins black; halteres testaceous. *Male.* Abdomen with luteous hairs towards the base. *Female.* Abdomen with cinereous hairs

towards the base; nearly half the apical part stylate. Length of the body 10-12 lines; of the wings 18-20 lines.

51. *ASILUS INTRODUCENS*, n. s. *Fæm.* Cinereo-niger, capite aurato, antennis nigris, thorace vittis duabus lateribusque cinereis, abdomine fasciculis quatuor basalibus cinereis dimidio apicali stylato, pedibus nigris robustis rufo variis, alis fusciscentibus, halteribus fulvis. *Mas?* Capite argenteo, abdomine fascia basali fasciculari fasciaque subapicali albidis latis, alis obscure cinereis.

Female. Cinereous black; head gilded in front, with cinereous hairs beneath; epistoma slightly prominent; mystax with several gilded bristles, and above with a few black bristles: antennæ black; 3rd joint lanceolate, nearly as long as the arista: thorax with two cinereous stripes, which are dilated on each humerus; sides and pectus cinereous: abdomen with two cinereous tufts on each side at the base; nearly half the apical part stylate: legs black, stout; femora red beneath and partly above; tibiæ with a broad red band: wings brownish, somewhat paler towards the base and about the borders of the posterior areolets; veins black; halteres tawny.

Male? Head silvery in front; mystax with several white, and above with a few black bristles; abdomen with a broad whitish tufted band at the base, and with a broad whitish subapical band; wings dark cinereous, partly paler, as in the female. Length of the body 8-12 lines; of the wings 12-16 lines.

52. *ASILUS AREOLARIS*, n. s. *Mas.* Cinereo-niger, capite aurato, antennis nigris basi fulvis, thorace vittis tribus cinereis, abdomine apice nigro nitente segmentis cinereo marginatis, pedibus fulvis, tarsis posterioribus nigris, alis fusciscenti-cinereis pallido lituratis triente basali albido, halteribus testaceis. *Fæm?* Antennarum articulo 3º fusiformi, alis fusciscentibus hyalino lituratis.

Male. Cinereous black; head gilded in front, clothed with black hairs beneath; epistoma prominent; mystax with many gilded bristles, and above with a few black bristles; antennæ black, tawny towards the base; thorax with three slender cinereous stripes, sides and pectus cinereous; abdomen black and shining at the tip, hind borders of the segments cinereous; legs tawny; posterior tarsi black; wings brownish cinereous, with paler marks in most of the areolets, white on more than one-third of the length from the base; veins black, tawny towards base; halteres testaceous.

Female? Epistoma less prominent; third joint of the antennæ fusiform, hardly half the length of the arista; wings brownish; marginal areolets with a nearly colourless spot in each. Length of the body 10 lines; of the wings 18 lines.

53. *ASILUS TENUICORNIS*, n. s. *Fæm.* Cinereus, capite argenteo, antennis testaceis parvis, thorace vittis duabus fusciscentibus, abdomine obscure cinereo segmentis testaceo marginatis, pedibus fulvis,

genubus tarsisque nigris, alis cinereis apice obscurioribus, halteribus testaceis.

Female. Cinereous; head silvery white in front; epistoma very slightly prominent; mystax with some white bristles, and above with very few black bristles: antennæ testaceous; 3rd joint conical, much shorter than the 1st joint, and not more than one-fourth of the length of the arista: thorax with two brownish stripes: abdomen dark cinereous; hind borders of the segments testaceous: legs tawny; tarsi, except at the base and knees, black: wings cinereous, dark cinereous towards the tips; veins black, tawny towards the base; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

Gen. OMMATIUS, *Illiger*.

54. OMMATIUS SCITULUS, n. s. *Mas et Fœm.* Fulvus, gracilis, capite cinereo antice albo, antennis nigris basi fulvis, thoracis disco cinereo-nigro, pectore testaceo, abdominis segmentis pallido marginatis, alis cinereis, halteribus testaceis.

Male and Female. Tawny, slender; head cinereous above, white in front; mystax with several white bristles; antennæ black, tawny towards the base. 3rd joint lanceolate, arista not longer than the 3rd joint; disk of the thorax cinereous black; pectus testaceous; hind borders of the abdominal segments pale; tarsi black towards the tips; wings cinereous; veins black, tawny towards the base; halteres testaceous. Length of the body 6-7 lines; of the wings 11-12 lines.

55. OMMATIUS STRICTUS, n. s. *Mas.* Niger, angustus, capite argenteo, pectore albido-cinereo, abdomine fusco maculis trigonis nigris, segmentis albido marginatis, pedibus fulvis, genibus tarsisque nigris, alis subcinereis extus nigricantibus, halteribus testaceis.

Male. Black, narrow; head silvery white in front; mystax with very few white bristles; third joint of the antennæ elongate-conical; arista a little longer than all the preceding joints together; pectus whitish cinereous; abdomen brown, each segment with a black triangular spot and with a whitish hind border; legs tawny; knees and tarsi black, the latter tawny at the base; wings greyish, exterior half blackish; veins black; halteres testaceous. Length of the body 4-4½ lines; of the wings 7-8 lines.

Gen. LEPTOGASTER, *Meigen*.

56. LEPTOGASTER MUNDA, n. s. *Mas.* Cinerea, capite argenteo, proboscide antennisque fulvis, thorace lineis duabus fuscis, abdomine longo gracili apicem versus subdilatato, segmentorum marginibus maculisque quatuor subapicalibus testaceis, pedibus fulvis, femoribus tibiisque posticis nigro fasciatis, alis subcinereis, halteribus testaceis.

Male. Cinereous; head silvery white; proboscis and antennæ tawny; thorax with two brown lines; abdomen long, slender, slightly dilated

towards the tip, hind borders of the segments testaceous, two testaceous spots on each side towards the tip; legs tawny, hind femora and hind tibiæ with a black band on each; wings slightly greyish; veins black, tawny at the base; halteres testaceous. Length of the body 6 lines; of the wings 8 lines.

Fam. LEPTIDÆ, *Westw.*

Gen. LEPTIS, *Fabr.*

57. LEPTIS FERRUGINOSA, *Wied.* See Vol. I. p. 118.

Heliomeia ferruginea, *Dolichall.*

Dr. Dolichall has described this species and several other Diptera in a Zoological Journal published in Java. I am unable to refer to this work, but have adopted the names with which he has ticketed the species in Mr. Wallace's collection.

Heliomeia has the aspect of *Leptis*, but is distinguished by the subanal and anal veins being united before they join the border of the wing, thus agreeing with *Chrysopila*, from which it differs in the shorter third joint of the antennæ, and in the more slender arista.

Gen. SURAGINA, n. g.

Fœm. *Corpus* lineare. *Caput* thorace vix angustius. *Proboscis* porrecta, compressa, capitis latitudine paullo brevior. *Palpi* lanceolati, porrecti. *Antennæ* brevissimæ; articulus 3^{us} rotundus; arista gracilis, nuda. *Abdomen* subdepressum, thorace non duplo longius, apice obtusum. *Pedes* nudi, inermes, longiusculi, sat graciles. *Alæ* mediocres, areola discali longissima.

Female. Body linear, moderately broad. Head almost as broad as the thorax; vertex and front of equal breadth. Proboscis porrect, compressed, a little shorter than the breadth of the head. Palpi lanceolate, contiguous to the proboscis. Antennæ very short; 3rd joint round; arista slender, bare, longer than the antenna. Thorax a little narrower in front. Abdomen somewhat flat, less than twice the length of the thorax, obtuse at the tip. Legs bare, unarmed, rather long and slender. Wings moderately long and broad; radial vein slightly curved; forks of the cubital vein a little longer than the preceding part; 3rd externo-medial vein inclined beyond the discal areolet towards the 4th, which is straight; subanal and anal veins united close to the border; discal areolet nearly six times longer than broad, its fore side hardly angular.

58. SURAGINA ILLUCENS, n. s. *Fœm.* Cinereo-nigra, capite argenteo-cinereo supra atro, palpis antennisque nigris, thorace vittis duabus cinereis, abdomine basi cinereo maculis duabus magnis basalibus apiceque testaceis, pedibus nigris, femoribus testaceis nigro cinctis, tibiis intermediis luridis, alis fuscis postice cinereis albo bifasciatis et bistrigatis.

Female. Cinereous black; head silvery grey, deep black above; proboscis, palpi, and antennæ black; thorax with two cinereous stripes; pectus cinereous; abdomen cinereous at the base; two large basal and lateral spots and the tip testaceous; legs black, femora testaceous, anterior femora black towards the base, hind femora with a broad black band, middle tibiæ lurid; wings brown, cinereous along the basal part of the interior border; two white abbreviated bands and two white intermediate streaks; veins black; halteres testaceous, with black knobs. Length of the body 7 lines; of the wings 12 lines.

Fam. BOMBYLIDÆ, *Leach.*

Subfam. THEREVITES, *Walk.*

Gen. THEREVA, *Latr.*

59. *Thereva congrua*, *Walk.* See Vol. II. p. 90.

Subfam. BOMBYLITES, *Walk.*

Gen. ANTHRAX, *Fabr.*

60. *Anthrax Tantalus*, *Fabr. Ent. Syst.* iv. 260. 15.

Inhabits also Hindostan, China, and Java.

61. *Anthrax semiscita*, *Walk.* See Vol. I. p. 118.

62. ANTHRAX PRETENDENS, n. s. *Fœm.* Nigra, fulvo tomentosa, thorace strigis duabus albidis, abdomine fasciis albidis maculisque duabus apicalibus albis, alis subcinereis basi nigris apud costam nigricantibus, halteribus albidis.

Female. Black; head with tawny tomentum in front, cinereous behind and beneath; thorax with tawny hairs in front and on each side, a whitish streak on each side by the base of the wing; abdomen with whitish bands, and with a white spot on each side at the tip, sides with tawny hairs at the base; wings slightly cinereous, black at the base, blackish along nearly half the length of the costa; veins black; radial vein forming a right angle at its base, curved towards its tip; fore branch of the cubital vein deeply curved; externo-medial veins almost straight; subanal and anal veins approximate on the hind border; halteres whitish. Length of the body 6 lines; of the wings 12 lines.

This and the two following species belong to the group of which *A. hottentotta* is the type.

63. ANTHRAX ANTECEDENS, n. s. *Fœm.* Nigra, flavescens pilosa, capite cinereo, abdomine fasciis late interruptis guttisque duabus apicalibus albis, lateribus anticis albo pilosis, alis hyalinis basi nigricanti-fuscis.

Female. Black; head cinereous in front and beneath; thorax with pale-

yellowish hairs in front and on each side; abdomen with broadly interrupted white bands, a white dot on each side at the tip, sides with white hairs towards the base; wings hyaline, blackish brown at the base; veins black; radial vein curved towards the tip; fore branch of the cubital vein deeply curved; externo-medial veins straight; subanal and anal veins somewhat approximate on the hind border, Length of the body 4 lines; of the wings 8 lines.

64. *ANTHRAX CONGRUA*, n. s. *Mas.* Nigra, albo pilosa, capite abdominisque lateribus nigro pilosis, abdomine fasciis duabus pallidis, alis subcinereis basi et apud costam nigricantibus, litura costali basali argentea.

Male. Black; head and sides of the abdomen clothed with short black hairs; antennæ very short, 3rd joint round; thorax clothed with white hairs in front and along each side; abdomen with two slender pale bands; wings slightly greyish, blackish at the base and along half the length of the costa, which has a silvery mark at its base; veins black; radial vein curved towards its tip; fore branch of the cubital vein deeply curved; externo-medial veins straight; subanal and anal veins somewhat approximate on the hind border. Length of the body 3 lines; of the wings 6 lines.

65. *ANTHRAX DEMONSTRANS*, n. s. *Fæm.* Nigra, flavescente pilosa, capite cinereo, abdomine fascia subinterrupta guttisque duabus apicalibus albis, lateribus nigro pilosis basi luteo pilosis, alis nigricantibus basi et apud costam nigris.

Female. Black; head with cinereous tomentum behind and beneath; thorax with yellowish hairs on each side; abdomen with a white middle band, which is almost interrupted in the middle and slightly dilated on each side, a white dot on each side at the tip; sides with black hairs, and at the base with luteous hairs; wings blackish, black at the base and along the costa; radial vein forming a rounded angle at its base, as deeply curved towards its tip as is the fore branch of the cubital vein, to which it is parallel; 1st and 2nd externo-medial veins undulating, 3rd nearly straight; subanal and anal veins approximate on the hind border. Length of the body 5 lines; of the wings 10 lines.

66. *ANTHRAX PRÆDICANS*, n. s. *Fæm.*; Nigra, nigro pilosa, antennis brevissimis articulo 3° rotundo, pedibus piceis, alis nigricantibus, albido strigatis, apice et apud marginem posticum cinereis.

Female. Black; head and sides of the thorax and of the abdomen clothed with short black hairs; antennæ very short, 3rd joint round; legs piceous; wings blackish, dark grey at the tips and along the hind border; discal, pobrachial, 3rd externo-medial, and anal areolets with whitish streaks; radial vein undulating towards its tip; fore-branch of the cubital vein slightly curved; externo-medial veins straight; subanal and anal veins approximating closely on the hind

border ; hind side of the discal areolet forming a right angle, and emitting thence the stump of a vein. Length of the body $4\frac{1}{2}$ lines ; of the wings 9 lines.

67. ANTHRAX DEGENEREA, *Walk.* See Vol. I. p. 15. *var. Mas et Fæm.* Nigra, angusta, fulvo-pilosa, capite cinereo, antennarum articulo 3^o conico, pectore subargenteo, abdomine fasciis duabus ventre pedibus halteribusque fulvis, tarsis nigris, alis fuscis, apice margineque postico cinereis.

Male and Female. Black, narrow, head cinereous ; 3rd joint of the antennæ conical ; arista very short ; thorax with tawny hairs ; pectus silvery cinereous ; abdomen with two lateral tawny stripes, which are broadest in the female ; underside, legs and halteres tawny ; tarsi black ; wings brown, long, narrow, cinereous towards the tips and along the hind border ; radial vein curved towards its tip : fore branch of the cubital vein slightly curved, sharply angular at its base ; externo-medial veins straight ; subanal and anal veins approximate on the hind border. *Male.* Hind femora with black tips ; angle of the fore branch of the cubital vein emitting the stump of a vein.

Var. β. Female. Sides of the abdomen less tawny ; wings dark brown, cinereous at the tips ; fore branch of the cubital vein deeply curved, with its angle emitting the stump of a vein. Length of the body $3\frac{1}{2}$ –5 lines ; of the wings 8–12 lines.

This species is closely allied to *A. fervida*, and, like the two preceding species, approaches the Australian group (sub-g. *Neuria*), which is distinguished by the long wings with contorted veins.

68. ANTHRAX PROFERENS, n. s. *Mas.* Atra, angusta, abdominis lateribus basalibus albo-pilosis, alis longis atris apud marginem posticum exteriorem limpidis, puncto discali albo, litura exteriore transversa albida.

Male. Deep black, slender ; head clothed with short black hairs ; antennæ and arista very short ; 3rd joint round ; abdomen with white hairs on each side at the base ; wings long, deep black, limpid along the exterior part of the hind border ; a white point in the discal areolet, and a little transverse whitish mark at the base of the fore branch of the cubital vein ; the latter deeply curved. Length of the body 4 lines ; of the wings 12 lines.

Allied to the group of which *A. hyalacra* is the type.

Gen. SYSTROPUS, *Wied.*

69. SYSTROPUS SPHEGOIDES, n. s. *Mas.* Niger, capite albido-testaceo, antennis apices versus lanceolatis, thorace strigis quatuor lateralibus pallide flavis, abdomine lurido basi et apicem versus nigro, petiolo longissimo, femoribus subtus tibiisque apice luridis, alis nigricante-cinereis, halteribus albidis nigro fasciatis.

Male. Black ; head white behind, whitish testaceous in front about the

eyes; proboscis longer than the breadth of the head, its sheaths diverging and convoluted at the tips; antennæ a little longer than the proboscis, lanceolate towards the tips; thorax with two pale-yellow streaks on each side, one in front, the other behind the wing; abdomen lurid, black at the base, above, and towards the tip, where it is fusiform; its petiole very long and slender; femora beneath and tibiæ towards the tips lurid; wings blackish grey; veins black; halteres whitish, with a black subapical band. Length of the body 7 lines; of the wings 8 lines.

Fam. DOLICHOPIDÆ, *Leach.*

Gen. PSILOPUS, *Meigen.*

70. *PSILOPUS SPECTABILIS*, n. s. *Mas.* Aureo-viridis, capite purpurascente-cyaneo, antice argenteo, antennis testaceis, thorace vittis tribus cupreis, scutello cyaneo, abdominis lateribus cupreis, pedibus flavis, alis albis, costa lituris duabus costalibus lutescentibus, halteribus testaceis.

Male. Bright golden green; head purplish blue, with silvery tomentum in front; antennæ testaceous; arista black, shorter than the thorax; thorax with three bright cupreous stripes; scutellum blue; pectus silvery; abdomen bright cupreous along each side; legs yellow; tarsi black towards the tips; wings white, brown along the costa and on more than one-third of the length from the tips, with the exception of the hind border; the costal brown part including two transverse lutescent marks, beyond which there is a brown band; veins black; fore branch of the præbrachial vein nearly straight; discal transverse vein straight; halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

71. *PSILOPUS FILIFER*, n. s. *Mas.* Viridescente-cyaneus, capite pectoreque argenteis, antennis pedibusque nigris, arista longissima, abdomine viridi fasciis nigris, tibiis anterioribus albidis, alis subcinereis.
Fem.? Viridis, capite cyaneo, tibiis anterioribus testaceis.

Male. Greenish blue; head and pectus with silvery white tomentum; antennæ black; arista much longer than the body; abdomen green, with a black band on the base of each segment; legs black, long, slender; anterior tibiæ dingy whitish; wings slightly cinereous; veins black; fore branch of the præbrachial vein much curved; discal transverse vein very slightly undulating.

Female? Bright green; head blue, its fore part and the pectus with silvery white tomentum; abdomen with black bands; anterior tibiæ testaceous; discal transverse vein straight. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

72. *PSILOPUS ÆSTIMATUS*, n. s. *Mas.* Viridis, capite pectoreque argenteis, antennis nigris basi testaceis, abdomine fasciis latis nigris, pedibus flavescentibus, femoribus posticis apice tarsisque nigris, alis subcinereis, halteribus testaceis.

Male. Bright green; head in front and pectus silvery white; antennæ black, testaceous at the base; arista about as long as the thorax; abdomen with a broad black band on the base of each segment; legs yellowish, stout; tarsi black; femora paler than the tibiæ; hind femora with black tips; wings greyish; veins black; cubital vein slightly curved; fore branch of the præbrachial vein much curved; discal transverse vein straight; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

73. *PSILOPUS ABRUPTUS*, n. s. *Mas.* Viridis, capite cyaneo, facie pectoreque subargenteis, antennis pedibus halteribusque nigris, abdomine cyanescente-viridi, alis cinereis.

Male. Bright green; head blue; its fore part and the pectus somewhat silvery; antennæ black; arista hardly longer than the thorax; abdomen bluish green; legs black; wings grey; veins black; fore branch of the cubital vein forming a much rounded right angle, from whence it is straight to its tip; discal transverse vein straight, parted by half its length from the border, and by less than its length from the fork of the cubital; halteres black. Length of the body 2 lines; of the wings 4 lines.

Gen. *DOLICHOPUS*, *Latr.*

74. *DOLICHOPUS CINEREUS*, n. s. *Mas.* Cinereus, capite albo, antennis fulvis, pectore alido, abdomine fasciis æneo-nigris, pedibus testaceis, tarsis anterioribus apice nigricantibus, tibiis posticis apice tarsisque posticis nigris, alis cinereis, halteribus testaceis.

Male. Cinereous, not metallic; head white between the eyes; antennæ tawny; 3rd joint elliptical; arista black, much longer than the antennæ; pectus whitish; abdomen with an æneous black band on each segment; legs testaceous, stout; anterior tarsi blackish towards the tips; hind tarsi and tips of hind tibiæ black; wings grey; veins black; præbrachial vein forming a right angle at its flexure, much curved from thence to the border; discal transverse vein slightly bent outwards; halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

75. *DOLICHOPUS PRÆDICANS*, n. s. *Fæm.* Cinereus, capite pectoreque albis, antennis fulvis, thorace vitta apiceque viridibus, abdomine maculis lateralibus albis, pedibus testaceis, femoribus posticis nigro lineatis, alis cinereis basi nigricantibus, halteribus fulvis.

Female. Cinereous; head and pectus white; antennæ tawny; arista black, longer than the antennæ; thorax with a dorsal stripe and the hind part green; abdomen with white spots along each side; legs testaceous, stout; tibiæ beset with black spines; tarsi black towards the tips; hind femora with a black line; wings cinereous, blackish towards the base; veins black; præbrachial vein gently curved outwards at its flexure, straight from thence to the border; discal trans-

verse vein straight; halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

76. *DOLICHOPUS PROVECTUS*, n. s. *Fam.* Viridis, capite pectoreque argenteis, antennis nigris latiusculis basi testaceis, thorace vittis duabus nigris, abdomine fasciis argenteis, pedibus nigris, robustis spinosis, tibiis testaceis, alis obscure cinereis.

Female. Bright green; head in front and pectus silvery white; antennæ black, rather broad, testaceous towards the base; 3rd joint conical; arista much longer than the antennæ; thorax with a black stripe on each side; abdomen with silvery white bands; legs black, stout, spinose; tibiæ testaceous; wings dark grey; veins black; præbrachial vein forming a very obtuse angle at its flexure, straight from thence to the border; discal transverse vein straight. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

77. *DOLICHOPUS PRÆMISSUS*, n. s. *Mas.* Obscure viridis, capite pectoreque cinereis, antennis nigris, abdomine viridescente-nigro, pedibus nigris vix spinosis, tibiis ferrugineis, alis obscure cinereis, halteribus fulvis.

Male. Approaches the *Psilopi* in some of its characters. Dark green; head in front and pectus cinereous; antennæ black, very small and short; 3rd joint conical; arista as long as the breadth of the head; abdomen greenish black; legs black, hardly spinose or setose; tibiæ ferruginous; wings dark grey; veins black; præbrachial vein hardly bent between the straight discal transverse vein and the border; halteres tawny. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

78. *DOLICHOPUS PROVENIENS*, n. s. *Fam.* Obscure viridis, capite albo, antennis nigris, thorace vittis duabus pectoreque cinereis, abdomine cyanescete-viridi fasciis cupreis, pedibus nigris, femoribus anterioribus apice tibiisque fulvis, alis nigricantibus, halteribus fulvis.

Female. Dark green; head white in front and about the eyes; antennæ black; 3rd joint round; arista shorter than the breadth of the head; thorax with two cinereous stripes; pectus cinereous; abdomen bluish green, with cupreous bands; legs black; tibiæ and tips of anterior femora tawny; wings blackish; veins black; præbrachial vein quite straight; discal transverse vein straight, parted by twice its length from the end of the subanal vein; halteres tawny. Length of the body 2 lines; of the wings 4 lines.

Gen. *CHRYBOTUS*, *Meigen*.

79. *CHRYBOTUS EXACTUS*, n. s. *Mas.* Obscure viridis, cinereo-tomentosus, antennis pedibusque nigris, abdomine obscure cupreo, tibiis anticis fulvis, alis cinereis.

Male. Dark green, with cinereous tomentum; antennæ black; 3rd joint conical; arista much shorter than the breadth of the head; abdomen dark-cupreous; legs black; fore tibiæ tawny; wings grey;

veins black; præbrachial vein hardly bent exteriorly; discal transverse vein parted by more than four times its length from the end of the subanal vein. Length of the body $1\frac{1}{4}$ line; of the wings 2 lines.

Gen. DIAPHORUS, *Meigen*.

80. DIAPHORUS RESUMENS, *Wlk.* See Vol. 11. p. 93.

Fam. LONCHOPTERIDÆ, *Curtis*.

Gen. CADREMA, n. g.

Mas. Corpus breviusculum, sat gracile. Caput thorace vix angustius; facies subobliqua. Antennæ brevissimæ; arista apicalis, longa, subpubescens. Abdomen ovatum, thorace vix longius. Pedes posteriores robusti; tibiæ posticæ calcare apicali arcuata. Alæ angustæ, lanceolatae.

Male. Body rather short and slender; head nearly as broad as the thorax; face slightly oblique. Antennæ extremely short; arista long, apical, minutely pubescent. Abdomen oval, hardly longer or broader than the thorax. Posterior legs stout; hind tibiæ with a curved apical spur. Wings narrow, lanceolate; cubital vein and præbrachial vein parallel, the latter ending at the tip of the wing; discal transverse vein straight, ending at full thrice its length from the border and at nearly thrice its length from the præbrachial transverse.

81. CADREMA LONCHOPTEROIDES, n. s. *Mas.* Testacea, antennis luteis, thoracis disco et metathorace nigris, abdomine apicem versus nigricante, alis vitreis macula apicali nigricante.

Male. Testaceous; antennæ luteous; disk of the thorax and metathorax black; abdomen blackish towards the tip; wings vitreous, with a blackish apical spot; veins black, testaceous towards the base. Length of the body $1\frac{3}{4}$ line; of the wings 4 lines.

Fam. PLATYPEZIDÆ, *Haliday*.

Gen. PLATYPEZA, *Meigen*.

82. PLATYPEZA GLAUDESCENS, n. s. *Mas et Fœm.* Piceo-nigra, capite gutta atra, thoracis disco cyanescente-cinereo, abdomine nigro, pedibus halteribusque piceis, tarsis albidis, posticis dilatatis, alis vitreis.

Male and Female. Piceous black; head with a deep black dot in front; disk of the thorax with a bluish-cinereous tinge; abdomen black; legs piceous; tarsi whitish; hind tarsi dilated; wings quite vitreous; veins black; discal transverse vein parted by nearly twice its length from the border, and by more than twice its length from the fork of the præbrachial vein; fore branch of the latter joining the termination of the costal vein at the tip of the wing, close to the end of the cubital vein; halteres piceous. Length of the body $1-1\frac{1}{2}$ line; of the wings $2-2\frac{1}{2}$ lines.

Fam. SIPPHIDÆ, *Leach.*Gen. CERIA, *Fabr.*

83. *CERIA LATERALIS*, n. s. *Mas.* Nigra, capite vittis guttisque duabus, thorace maculis octo, pectore fasciis duabus, abdomine maculis duabus basalibus fasciisque duabus flavis, antennarum petiolo pedibusque rufis, alis subcinereis, basi costa strigaeque fuscis, halteribus flavis.

Male. Black; head with two yellow stripes in front, and with a yellow dot on each side at the base of the antennæ; petiole of the latter reddish; 3rd joint elongate-fusiform: thorax with three yellow calli on each side; scutellum with two oblique fusiform yellow spots which are united hindward; pectus with a yellow band on each side; abdomen with a slender petiole which is as long as the terminal fusiform part; a yellow spot on each side of the base; hind borders of the 1st and 2nd segments yellow; legs red; tarsi piceous; wings greyish, dark brown at the base, whence a dark brown streak proceeds to the disk; costa dark brown, blackish exteriorly; veins black; halteres yellow. Length of the body 12 lines; of the wings 16 lines.

Gen. MILESIA, *Latr.*

84. *MILESIA CONSPICIENDA*, n. s. *Mas et Fæm.* Nigra, capite flavo maculis duabus nigris, palpis antennisque rufescentibus, thorace vittis fasciis maculisque duabus, scutelli margine abdomineque fasciis tribus flavis, abdomine fasciis tribus chalybeis, pedibus luteis, femoribus nigro vittatis, tarsis nigris apice luteis, alis cinereis apud costam fuscis.

Male and Female. Black; head yellow, with an elongate black spot above the antennæ, and with another above the epistoma; mouth black; palpi and antennæ reddish; thorax with two yellow stripes; each of its sides in front with a large yellow spot, the latter connected with a band across the pectus; two yellow bands, the 1st interrupted; scutellum bordered with yellow; pectus with two yellow bands on each side; abdomen with three yellow bands and with three chalybeous bands; 3rd yellow band slightly interrupted; legs luteous; femora striped beneath with black; tarsi black, with luteous tips; wings grey, brown along the costa; veins black; halteres yellow. *Male.* Abdomen with a subapical interrupted band; 1st band notched on the hind side. *Female.* First abdominal band slightly interrupted. Length of the body 8-9 lines; of the wings 14-16 lines.

Gen. GRAPTOMYZA, *Wied.*

85. *GRAPTOMYZA TIBIALIS*, *Wlk.* See Vol. II. p. 95.

Fæm.? Lutea, crassa, lata, pubescens, vertice et epistomatis linea nigris, thoracis maculis duabus, disco postico, scutelli pectorisque discis cupreo-nigris, abdomine fasciis tribus nigris, femoribus anterioribus tibiisque nigro fasciatis.

Female? Luteous, pubescent, broad, thick; vertex black; epistoma

conical, forked at the tip, with a black line; proboscis longer than the thorax, black towards the base; arista plumose; two large spots on the thorax, its disk hindward, disk of the scutellum and disk of the pectus cupreous black; abdomen highly arched, with three black bands which are produced and slightly interrupted in the middle; apical band very broad; tibiæ and anterior femora with black bands; wings with a luteous stigma. Length of the body 5 lines; of the wings 8 lines.

Gen. *ERISTALIS*, *Latr.*

86. *Eristalis crassus*, *Fabr. Ent. Syst. IV. 281, 12.*

Inhabits also Hindostan.

87. *Eristalis Æsepus*, *Wlk. Cat. Dipt. pt. 3, 625.*

Inhabits also China.

88. *ERISTALIS BOMBOIDES*, n. s. *Mas. Ater, capite albo, arista nuda, thorace pubescente fascia cinerea fasciaque chalybeo-nigra, pectore cinereo, abdomine fasciis quatuor chalybeo-nigris, vittis duabus ventralibus latis albidis, tibiis basi flavis, alis nigricante-fuscis cinereo marginatis, halteribus flavis.*

Male. Deep black; head with black hairs on the front and with white tomentum in front and behind; arista simple; thorax thickly pubescent, having in front a cinereous band which is tawny on each side, and a chalybeous black hinder band; scutellum chalybeous-black; pectus cinereous; abdomen with four chalybeous-black bands; the 1st widely interrupted; under side with a broad short whitish stripe on each side; hind (and anterior?) tibiæ yellow at the base; wings blackish-brown, cinereous towards the tips and along the hind border; veins black; halteres yellow. Length of the body $5\frac{1}{2}$ lines; of the wings 11 lines.

Gen. *HELOPHILUS*, *Meigen.*

The two following *Helophili* may be merely varieties of *H. quadrivittatus*.

89. *HELOPHILUS CONSORS*, n. s. *Mas. Niger, thorace vittis quatuor flavis, scutello luteo, abdomine vittis tribus luteis tribusque chalybeis, tibiis basi luteis, femoribus posticis incrassatis, alis cinereis apud costam fusciscentibus, halteribus flavis.*

Male. Black; thorax with four yellow stripes; scutellum luteous; pectus cinereous; abdomen with three luteous bands and with four chalybeous bands; 1st luteous band interrupted, very broad; 3rd and 4th slightly excavated on the hind side; tibiæ luteous towards the base; hind femora incrassated; hind tibiæ curved; wings cinereous, brownish along the costa; veins black; halteres yellow. Length of the body 5 lines; of the wings 9 lines.

90. *HELOPHILUS CONCLUSUS*, n. s. *Mas. Niger, capite albo, antennis*

rufescentibus, arista nuda, thorace vittis quatuor flavis, scutello fulvo, abdomine fasciis quatuor lineaque transversa flavis fasciaque chalybea, pedibus nigro-luteis, tarsis nigris, alis cinereis apud costam subfuscis, halteribus flavis.

Male. Black ; head white, with a black callus above the antennæ, which are reddish ; arista simple ; proboscis black ; thorax with 4 yellow stripes ; scutellum tawny ; pectus with a broad oblique pale yellow band on each side ; abdomen with 4 yellow bands ; 1st and 2nd bands very broad ; 1st interrupted ; 2nd interrupted except in front, where there is a yellow transverse line ; 3rd and 4th narrow, with a chalybeous band along the hind border of the 3rd ; legs luteous, shaded with black ; tarsi wholly black ; wings grey, slightly brown along the costa ; veins black, tawny towards the base ; halteres yellow. Length of the body 5 lines ; of the wings 9 lines.

Gen. MERODON, *Fabr.*

91. MERODON INTERVENIENS, n. s. *Mas.* Fuscus, flavescens-cinereo tomentosus, capite testaceo, antennis nigris, arista nuda, scutello fulvo, abdomine fasciis septem ventrequae testaceis, pedibus fulvis, femoribus nigro vittatis, femoribus posticis incrassatis, tibiis posticis nigris, alis cinereis litura costali nigricante, halteribus flavis.

Male. Brown ; head with short black hairs on the vertex, white behind, pale testaceous, and with a brown stripe in front ; proboscis and antennæ black ; arista simple ; thorax thickly clothed with yellowish cinereous down ; scutellum tawny ; pectus cinereous ; abdomen cylindric-conical, with seven testaceous bands ; under side testaceous ; legs tawny ; femora striped with black ; hind femora incrassated ; hind tibiæ curved, black ; wings cinereous, with a blackish mark by the middle of the costa ; veins black, halteres yellow. Length of the body 6 lines ; of the wings 10 lines.

Gen. VOLUCELLA, *Geoff.*

92. VOLUCELLA DECORATA, n. s. *Mas.* Fulva, oculis thoraceque pubescentibus, hujus disco cupreo-nigro, abdomine cupreo-nigro fasciis tribus flavis, pedibus piceo-fulvis, tarsis piceis basi fulvis, alis vitreis, costa lutea extus fuscescens, halteribus apice niveis.

Male. Tawny ; epistoma very prominent ; eyes pubescent ; arista broadly plumose ; thorax pubescent ; disk cupreous-black ; abdomen cupreous-black, with three yellow bands ; 1st band basal ; legs slightly shaded with piceous ; tarsi piceous, tawny at the base ; wings vitreous, luteous and exteriorly brownish along the costa ; veins tawny, black towards the tips ; halteres with snow-white knobs. Length of the body 7 lines ; of the wings 14 lines.

Gen. BARYTEROCERA, *Walk.* See Vol. I. p. 123.

93. BARYTEROCERA GIBBULA, n. s. *Fam.* Cupreo-nigra, capite fla-

vescente vitta cupreo-nigra, antennis fulvis, thoracis lateribus fasciaque flavis, abdominis lateribus fasciis tribus flavis strigisque tribus flavis, pedibus flavis, tibiis posticis femoribusque nigris apice flavis, alis cinereis, litura costali fasciisque duabus exterioribus nigricantibus.

Female. Cupreous black; head in front yellowish with a cupreous-black stripe; antennæ tawny; 3rd joint long, linear, obtuse at the tip; thorax yellow along each side and with a yellow band in front of the scutellum; abdomen yellow along each side and with three yellow bands; 1st band entire; 2nd nearly interrupted; 3rd emitting a lanceolate streak in front and two hindward streaks which extend to the tip; legs yellow; femora and hind tibiæ black with yellow tips; wings cinereous, with a blackish mark by the middle of the costa, and with two exterior slender blackish bands; veins black; halteres yellow. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. EUMERUS, *Meigen*.

94. EUMERUS FIGURANS, n. s. *Fæm.* Niger, capite albo vitta cyanea, scutelli margine postico fulvo, abdomine nigro-æneo fasciis duabus albis, 2^a interrupta, tarsis subtus genubusque testaceis, alis subcinereis.

Female. Black, nearly cylindrical; head whitish, with a dark blue stripe on the vertex; antennæ with whitish tomentum; 3rd joint somewhat dilated, rather broader than long; scutellum tawny along the hind border; pectus cinereous; abdomen æneous-black, minutely punctured, with two white bands, placed oblique with regard to the segments, the 2nd interrupted; tarsi beneath and knees testaceous; wings greyish; veins black; cubital vein much contorted; halteres testaceous. Length of the body $5\frac{1}{2}$ lines; of the wings 6 lines.

Gen. SYRITTA, *St. Farg.*

95. SYRITTA ILLUCIDA, n. s. *Fæm.* Ænea, capite argenteo, vertice nigro punctis duobus nigris, antennis pallide rufis, abdomine fasciis duabus latis interruptis testaceis maculisque duabus subapicalibus albis, pedibus testaceis, femoribus tibiisque posticis nigris, his rufo fasciatis, alis subcinereis.

Female. Æneous; head silvery white; vertex black, with an elongated white point on each side; antennæ pale red; pectus and sides of the thorax whitish; abdomen with two broad interrupted testaceous bands; apical segment with a white spot on each side at the base; under side testaceous except near the tip; legs testaceous; hind femora and hind tibiæ black, the latter with a red band; wings greyish-vitreous; veins black. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

Gen. BACCHA, *Fabr.*

96. BACCHA DISPAR, n. s. *Mas.* Cupreo-nigra, capite chalybeo-nigro vittis duabus flavis, antennis rufis, thorace maculis quatuor luteis, ab-

domine fasciis duabus arcuatis luteis, pedibus rufescentibus, alis subcinereis, costa fasciaque nigricante fuscis, halteribus fulvis. *Fæm.* Scutello flavo apud discum nigricante, abdominis petiolo fulvo, fascia 2^a non arcuata, apice chalybeo, pedibus testaceis, posticis nigro fasciatis.

Male. Cupreous black; head chalybeous black, with a yellow stripe on each side in front; antennæ red, very short; 3rd joint conical; arista black, short; thorax with two luteous spots on each side; the 1st pair joining a luteous band on each side of the pectus; abdomen petiolated, clavate, with two much-arched luteous bands; legs reddish; wings slightly cinereous, blackish-brown along the costa, and with an irregular blackish-brown band, which hardly extends to the hind border; veins black; halteres tawny.

Female. Scutellum yellow, with a blackish disk; abdomen much compressed, with a long slender linear tawny petiole; the 2nd yellow band not arched; tip chalybeous; legs testaceous; hind femora slightly banded with black; hind tibiæ black towards the tips. Length of the body $4\frac{1}{2}$ –5 lines; of the wings 8–9 lines.

Gen. SYRPHUS, *Fabr.*

97. *Syrphus consequens*, *Wlk.* See Vol. I. p. 18.

Fam. MUSCIDÆ, *Latr.*

Subfam. TACHINIDÆ, *Walk.*

Gen. NEMORÆA, *Macq.*

98. *NEMORÆA AMPLIFICANS*, n. s. *Fæm.* Cinereo-nigra, capite testaceo, frontalibus nigris, palpis fulvis, antennis piceis, thorace vittis quinque nigris, scutello ferrugineo, abdomine piceo fasciis duabus latis interruptis cinereis, alis cinereis basi et apud costam fuscis.

Female. Cinereous black, with black bristles; head testaceous, more cinereous beneath; frontalia black, slightly widening to the face, with a row of bristles along each side; facialia not bristly; epistoma not prominent; palpi tawny; antennæ piceous, not extending to the epistoma; 3rd joint linear, rounded at the tip, full twice the length of the 2nd; arista nearly twice the length of the 3rd, stout for full half its length; thorax with five slender black stripes, thickly beset with long stout bristles; scutellum ferruginous except towards its base; abdomen piceous, setose towards its tip; 2nd and 3rd segments with broad interrupted cinereous bands along their fore borders; legs stout, bristly; wings grey, brown at the base and in front; veins black; præbrachial vein forming a slightly obtuse angle at its flexure, from whence it is very slightly curved inward to its tip; discal transverse vein straight, excepting a very slight inward bend near its base, parted by rather more than half its length from the border, and from the flexure of the præbrachial; alulæ cinereous-white. Length of the body 8 lines; of the wings 14 lines.

99. *NEMORÆA TENEBROSA*, n. s. *Fœm.* Cinereo-nigra, capite albedo, frontalibus nigris, oculis pubescentibus, palpis et antennarum articulo 2° rufescentibus, thorace lineis quinque nigris, scutello rufo, abdomine obscure rufescente tessellis cinereis, femoribus posticis fimbriatis, alis cinereis, basi costa et venarum marginibus obscure fuscis.

Female. Cinereous black, with black bristles; head whitish; frontalia black, slightly widening to the face, with a row of bristles along each side and beyond it; facialia bristly along most of the length; epistoma not prominent; eyes pubescent; palpi reddish; antennæ not nearly reaching the epistoma; 3rd joint linear, slender, obtuse at the tip, much less than twice the length of the 2nd, which is reddish; arista stout for full half its length, much longer than the 3rd joint; thorax with five black lines; scutellum red, black at the base; abdomen dark reddish, slightly tessellated with cinereous; legs black, bristly; hind femora fringed with short black hairs; wings grey, dark brown at the base, along the costa and along the black veins; præbrachial vein forming a right angle at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein much curved inward near its base, parted by much less than its length from the border and by rather less than its length from the flexure of the præbrachial; alulæ lurid-cinereous. Length of the body 6 lines; of the wings 12 lines.

Gen. *MASICERA*, *Maq.*

100. *MASICERA DOTATA*, n. s. *Fœm.* Cinerea, capite albo, frontalibus atris, oculis nudis, proboscide palpisque fulvis, thorace vittis quatuor nigris, abdomine longi-elliptico fasciis cinereis, alis luridis angustis, dimidio apicali obscure fusco, margine postico cinereo, halteribus testaceis.

Female. Cinereous, beset with numerous long stout black bristles; head white, clothed behind and beneath with white hairs; frontalia deep black, slightly widening towards the face, with stout bristles along each side; facialia without bristles except by the epistoma, which is not prominent; eyes bare; proboscis and palpi tawny; antennæ nearly reaching the epistoma; 3rd joint slightly broader towards the tip, which is rounded, about four times the length of the 2nd; arista stout at the base, very much longer than the 3rd joint; thorax with four black stripes; abdomen elongate-elliptical, its bristles stouter than those of the thorax; a cinereous band along the fore-border of each segment; lips black, stout, bristly; wings lurid, narrow, dark brown on the exterior half, cinereous along the hind border; veins tawny, black exteriorly; præbrachial vein extending rather beyond the slightly acute angle which it forms at its flexure, much curved inward from thence to its tip; discal transverse vein undulating, parted by rather less than its length from the border and from the flexure of the præbrachial; alulæ cinereous; halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

101. *MASICERA HORRENS*, n. s. *Fæm.* Albido-cinerea, valde setosa, capite albo, facie obliqua, oculis pubescentibus, thorace vittis quatuor nigris, abdomine subfusiformi spinoso fasciis tribus latis subinterruptis albidis, alis cinereis basi et apud costam subfuscis, alulis albido-cinereis.

Female. Whitish cinereous, thickly beset with long stout black bristles; head white, clothed behind and beneath with white hairs; frontalia deep black, hardly widening towards the face, with bristles along each side and beyond it; face oblique; facialia with bristles along nearly two-thirds of the length; epistoma not prominent; eyes pubescent; palpi black, rather long; antennæ nearly reaching the epistoma; 3rd joint linear, rounded at the tip, full four times the length of the 2nd; arista very much longer than the 3rd joint, stout for more than one-third of its length; thorax with four black stripes; abdomen nearly fusiform, more spinose than bristly, with three broad slightly interrupted whitish bands on the fore borders of the segments; legs black, stout, bristly; wings grey, slightly brown at the base and along the costa; veins black; præbrachial vein forming a somewhat rounded right angle at its flexure, near which it is much curved inward and is thence straight to its tip; discal transverse vein undulating, parted by about its length from the border and by much less than its length from the flexure of the præbrachial; alulæ whitish cinereous. Length of the body 7 lines; of the wings 12 lines.

102. *MASICERA IMMERSA*, n. s. *Fæm.* Albido-cinerea, capite argenteo, oculis nudis, palpis, antennis pedibusque nigris, thorace lineis quatuor nigris, abdomine nigro fasciis tribus latis interruptis cinereis, alis cinereis, alulis albido-cinereis albo marginatis.

Female. Whitish cinereous, with a few black bristles; head silvery white, with white hairs behind and beneath; frontalia black, widening towards the face, with a row of bristles along each side; facialia without bristles; epistoma not prominent; eyes bare; palpi black; antennæ not reaching the epistoma; 3rd joint linear, rounded at the tip, about four times the length of the 2nd; arista slender, very much longer than the 3rd joint; thorax with four slender black lines; abdomen black, conical, not longer than the thorax, with three broad interrupted cinereous bands along the fore borders of the segments; legs black, stout; wings grey; veins black; præbrachial vein forming a slightly rounded and obtuse angle at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein slightly undulating, parted by much less than its length from the border and from the flexure of the præbrachial; alulæ whitish cinereous with white borders. Length of the body 4 lines; of the wings 7 lines.

103. *MASICERA PROGNOSTICANS*, n. s. *Fæm.* Cinerea, gracilis, capite albo, abdomine nigro cylindrico fasciis albis, alis cinereis, alulis halteribusque albis.

Female. Cinereous, slender; head white; frontalia deep black, linear, with stout bristles along each side; facialia without bristles; epistoma not prominent; eyes bare; palpi short, slender; antennæ reaching the epistoma; 3rd joint linear, rounded at the tip, about six times the length of the 2nd; arista rather slender, not much longer than the 3rd joint; abdomen black, cylindrical, very much longer than the thorax, with a white band on the fore border of each segment; wings cinereous; veins black; præbrachial vein forming a slightly rounded and extremely obtuse angle at the flexure, straight from thence to the tip; discal transverse vein straight, parted by about its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ and halteres white. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Gen. EURYGASTER, *Macq.*

104. EURYGASTER RIDIBUNDA, n. s. *Fæm.* Cinerea, capite argenteo, oculis pubescentibus, palpis fulvis clavatis, antennis piceis, thorace lineis quatuor nigris, abdomine nigro fasciis tribus latis albido-cinereis, pedibus nigris, alis subcinereis basi et apud costam subluridis, halteribus fulvis.

Female. Cinereous, with black bristles; head silvery white in front and behind, clothed behind and beneath with white hairs; frontalia deep black, hardly widening towards the epistoma, with a few black bristles along each side and beyond; facialia without bristles; epistoma not prominent; eyes pubescent; palpi tawny, clavate; antennæ piceous, almost reaching the epistoma; 3rd joint linear, slightly rounded at the tip, nearly thrice the length of the 2nd; arista slender, very much longer than the 3rd joint; thorax with four black lines; abdomen black, conical, a little broader and longer than the thorax, with three broad whitish-cinereous bands, somewhat spinose towards the tip; legs black, hardly bristly; wings greyish, with a lurid tinge at the base and along part of the costa; veins black, tawny towards the base; præbrachial vein forming a rounded and obtuse angle at its flexure, nearly straight from thence to its tip; discal transverse vein hardly undulating, parted by little more than half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ cinereous; halteres tawny. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

105. EURYGASTER REMITTENS, n. s. *Fæm.* Cinerea, capite albo, oculis pubescentibus, palpis, antennis pedibusque nigris, thorace lineis quatuor nigris, scutello rufo, abdomine nigro fasciis cinereis fere interruptis, segmenti 2ⁱ lateribus rufescentibus, alis cinereis basi fusciscentibus, alulis albidis.

Female. Cinereous, slightly bristly; head white, clothed behind and beneath with white hairs; frontalia deep black, widening towards the face, with a row of bristles along each side and beyond; facialia without

bristles; epistoma not prominent; eyes pubescent; palpi black, short; antennæ almost reaching the epistoma; 3rd joint slightly widening towards the tip, which is rounded; arista slender, very much longer than the 3rd joint; thorax with four black lines; scutellum red, black at the base; abdomen black, conical, somewhat pilose at the tip, hardly broader or longer than the thorax, with cinereous nearly interrupted bands; 2nd segment reddish on each side; legs black, slightly bristly; wings grey, brownish at the base; veins black; præbrachial vein forming a slightly obtuse angle at its flexure, from whence it is hardly curved inward to its tip; discal transverse vein very slightly undulating, parted by a little more than half its length from the border, and by about half its length from the flexure of the præbrachial; alulæ whitish. Length of the body 5 lines; of the wings 8 lines.

106. *EURYGASTER APTA*, n. s. *Fæm.* Cinerea, capite albo, oculis nudis, palpis, antennis, pedibusque nigris, thorace vittis quatuor indistinctis, abdominis vitta dorsali et segmentorum marginibus posticis nigris, alis cinereis apud costam fusciscentibus, alulis albido-cinereis.

Female. Cinereous, with few bristles; head white; frontalia black, narrow, linear, with a row of bristles along each side and beyond; facialia without bristles; epistoma not prominent; eyes bare; palpi black; antennæ almost reaching the epistoma; 3rd joint linear, rounded at the tip, about four times the length of the 2nd; arista slender, very much longer than the 4th joint; thorax with four indistinct black stripes; abdomen conical, especially setose towards the tip, very little longer than the thorax; 1st segment, hind borders of the other segments and dorsal stripe black; legs black; wings grey, brownish along the costa; veins black; præbrachial vein forming an obtuse angle at its flexure, hardly curved inward from thence to its tip; discal transverse vein slightly undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial; alulæ whitish cinereous. Length of the body 4 lines; of the wings 7 lines.

107. *EURYGASTER CONGLOMERATA*, n. s. *Fæm.* Cinereo-nigra, capite albo, oculis pubescentibus, palpis, antennis pedibusque nigris, thorace lineis quatuor anticis nigris, thorace postico abdomineque anthracinis, tibiis posticis subfimbriatis, alis cinereis, alulis testaceo-albis.

Female. Cinereous black; head white, with white hairs behind and beneath; frontalia deep black, linear, with a row of bristles along each side and beyond; facialia without bristles; epistoma not prominent; eyes pubescent; palpi black; antennæ reaching the epistoma; 3rd joint linear, rounded at the tip, six times the length of the 2nd; arista much longer than the 3rd joint, stout to half its length; thorax with four black lines; hind part and abdomen coal black, shining, the latter conical, not longer than the thorax, setose towards the tip; legs black;

hind tibiæ slightly fringed ; wings grey ; veins black ; præbrachial vein forming a hardly obtuse angle at its flexure, almost straight from thence to its tip ; discal transverse vein undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial ; alulæ testaceous white, very large. Length of the body $4\frac{1}{2}$ lines ; of the wings 8 lines.

108. *EURYGASTER PROMINENS*, n. s. *Mas.* Cinereo-nigra, capite albo, oculis pubescentibus, palpis, antennis pedibusque nigris, thorace lineis quatuor indistinctis, abdominis basi vitta dorsali et segmentorum marginibus posticis nigris, scutelli apice rufescente, abdomine segmenti 2ⁱ lateribus subrufescentibus, alis cinereis, alulis albis.

Male. Cinereous black ; head white, with white hairs behind and beneath ; frontalia deep black, widening to the epistoma, with a row of bristles along each side and beyond ; facialia without bristles ; epistoma not prominent ; eyes pubescent ; palpi black ; antennæ extending to the epistoma ; 3rd joint linear, narrow, rounded at the tip, full four times the length of the 2nd ; arista much longer than the 3rd joint, stout to nearly half its length ; thorax with four indistinct black lines ; scutellum reddish towards its tip ; abdomen nearly oval, cinereous, not longer than the thorax ; 1st segment, hind borders of the following segments, and dorsal stripe black ; 2nd segment slightly reddish on each side ; legs black ; wings grey ; veins black ; præbrachial vein forming a right angle at its flexure, near which it is very slightly curved inward, and is thence straight to its tip ; discal transverse vein hardly undulating, parted by much less than its length from the border, and by less than its length from the flexure of the præbrachial ; alulæ white, very large. Length of the body $3\frac{1}{4}$ lines ; of the wings $6\frac{1}{2}$ lines.

109. *EURYGASTER DEDUCENS*, n. s. *Fæm.* Cinerea, capite albo, oculis nudis, palpis, antennis pedibusque nigris, thorace lineis quatuor, abdominis basi fasciisque tribus nigris, scutello rufescente, alis cinereis basi nigris, alulis albis.

Female. Cinereous, bristly, head white, with whitish hairs behind and beneath ; frontalia deep black, widening to the face, with black bristles along each side and beyond ; facialia without bristles, except by the epistoma, which is slightly prominent ; eyes bare ; antennæ reaching the epistoma ; 3rd joint linear, rather broad, slightly rounded at the tip, about four times the length of the 2nd ; arista much longer than the 3rd joint, stout to half its length ; thorax with four black lines ; scutellum reddish ; abdomen conical, not longer than the thorax, black at the base, and with three black bands on the hind borders of the segments ; wings grey, black at the base ; veins black, testaceous at the base, except along the costa ; præbrachial vein forming an obtuse angle at its flexure, slightly curved inward from thence to its tip ; discal transverse vein straight, except a slight curve at its base, parted

by a little more than half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ white. Length of the body $3\frac{3}{4}$ lines; of the wings 7 lines.

110. *EURYGASTER CONTRACTA*, n. s. *Fæm.* Cinerea, capite albo, palpis, antennis pedibusque nigris, thorace vittis quatuor nigris, abdomine nigro fasciis tribus latis subinterruptis argenteo-cinereis, alis cinereis basi nigricantibus, alulis albis.

Female. Cinereous, short; head white; frontalia deep black, widening slightly towards the face, with stout bristles along each side; facialia without bristles; epistoma not prominent; eyes bare; palpi and legs black; antennæ reaching the epistoma; 3rd joint linear, rounded at the tip, about four times the length of the second; arista stout for almost one-third of the length; thorax with four black stripes; abdomen black, nearly oval, not longer than the thorax, with three broad slightly interrupted silvery cinereous bands; wings cinereous, blackish at the base; veins black; præbrachial vein forming an obtuse angle at its flexure, nearly straight from thence to its tip; discal transverse vein curved inward towards its base, parted by less than its length from the border, and by about its length from the flexure of the præbrachial; alulæ white. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

111. *EURYGASTER PROGRESSA*, n. s. *Fæm.* Fulva, capite subtus et apud oculos albido, antennis pallide luteis apice fusciscentibus, abdomine maculis tribus dorsalibus nigris, alis cinereis apud costam luridis apice fuscis, halteribus testaceis.

Female. Tawny, with black bristles; head testaceous, whitish about the eyes and beneath; frontalia pale luteous, widening to the epistoma, beset with bristles along each side; facialia without bristles; epistoma not prominent; eyes bare; antennæ pale luteous, almost reaching the epistoma; 3rd joint linear, brownish towards the tip; arista stout to about one-third of the length; abdomen nearly oval, hardly longer or broader than the thorax, with three black dorsal spots; tarsi piceous; wings grey, lurid along the costa, brown towards the tips, except along the hind border; præbrachial vein forming a slightly obtuse angle at its flexure, much curved inward from thence to its tip; discal transverse vein undulating, parted by much less than its length from the border, and by about its length from the flexure of the præbrachial; alulæ and halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

Gen. *METOPIA*, *Meigen*.

112. *METOPIA INSPECTANS*, n. s. *Fæm.* Cinerea, capite magno argenteo subconico, facie perobliqua, thorace vittis quatuor, abdominis vitta dorsali et segmentorum marginibus posticis nigris; alis cinereis, alulis albis, halteribus piceis.

Female. Cinereous; head large, silvery, almost conical in front; frontalia black, linear, with a few bristles along each side; face very oblique; facialia without bristles; epistoma not prominent; eyes bare; proboscis and palpi black, very short; antennæ extending to the epistoma, 3rd joint linear, rounded at the tip, full six times the length of the 2nd; arista longer than the 3rd joint; stout to nearly half its length; thorax with four black stripes, the outer pair interrupted; abdomen conical, not longer than the thorax, hind borders of the segments and dorsal stripe black; legs black, rather short and stout; wings grey; veins black; præbrachial vein forming an almost right angle and emitting a branch at its flexure, from whence it is slightly curved inward to its tip; discal transverse vein straight, parted by much less than its length from the border and by very much less than its length from the flexure of the præbrachial; alulæ white; halteres piceous. Length of the body 3 lines; of the wings 5 lines.

113. *METOPIA INSTRUENS*, n. s. *Fæm.* Cinerea, capite subconico argenteo micante, facie perobliqua, palpis antennis pedibusque nigris, thorace vittis quatuor nigris, abdomine e maculis nigris trivittato, alis cinereis.

Female. Cinereous; head brilliant silvery, almost conical; face very oblique; facialia with bristles along each side; epistoma not prominent; eyes bare; palpi and legs black; antennæ reaching the epistoma, 3rd joint linear, rounded at the tip, about six times the length of the 2nd; arista longer than the 3rd, stout to about one-third of its length; thorax with four black stripes; abdomen with three rows of triangular black spots; wings cinereous; veins black; præbrachial vein forming an obtuse angle, and emitting a branch at its flexure, slightly curved inward from thence to its tip; discal transverse vein straight, parted by more than its length from the border and from the flexure of the præbrachial; alulæ white. Length of the body 3 lines; of the wings 5 lines.

Subfam. DEXIDES, *Walk.*

Gen. DEXIA, *Meigen.*

114. *DEXIA BASIFERA*, n. s. *Fæm.* Testaceo-alba, capitis antici lateribus palpisque fulvis, oculis nudis, antennis pallide luteis, thorace vittis quatuor nigris, abdomine fulvo fusiformi maculis trigonis nigris, macula fasciaque testaceis, pedibus nigris longis, femoribus fulvis apice nigris, tibiis ex parte fulvescentibus, alis cinereis apud venas nigricantibus, fascia basali obliqua alba, alulis albis.

Group of *D. longipes*.

Female. Testaceous white, narrow, bristly; head somewhat prominent; frontalia black, slightly widening towards the epistoma, with a few long stout black bristles on each side; facialia without bristles; epistoma not prominent; sides of the peristoma tawny and slightly pro-

duced; eyes bare; proboscis and palpi tawny, the former geniculated, rather long; antennæ pale luteous, 3rd joint lanceolate, not reaching the epistoma, thrice the length of the second; arista plumose: thorax with two slender deep black stripes and with two exterior broad blackish stripes; scutellum with six black spines: abdomen tawny, fusiform, longer than the thorax, with little black hairs, with several black spines, and with a triangular black spot on the hind border of each segment; 3rd segment with a testaceous spot at the base, 4th with a testaceous basal band: legs long, black; femora tawny, with black tips; tibiæ partly dark tawny: wings cinereous, blackish along the veins, with an oblique white basal band; costa black at the base; veins black, testaceous in the white part; præbrachial vein forming a slightly acute angle and emitting a short stump at its flexure, curved inward from thence to its tip; discal transverse vein undulating, parted by hardly more than half its length from the border, and by less than its length from the flexure of the præbrachial; alulæ white. Length of the body 5 lines; of the wings 10 lines.

Mas. Subaurato-cinerea, abdomine testaceo lanceolato longissimo fasciis maculisque trigonis nigris connexis, pedibus anticis longissimis, alis apud costam nigricantibus, venis vix nigricante marginatis.

Male. Pale gilded cinereous, narrow, bristly; frontalia piceous, widening much towards the epistoma, with bristles along each side; sides of the peristoma much produced; thorax with four deep black stripes, the outer pair rather broad; abdomen testaceous, lanceolate, twice the length of the thorax; hind border of each segment with a black band which is connected with a triangular black spot; legs very long, fore legs extremely long; wings blackish along the costa, hardly blackish along the veins; præbrachial vein curved slightly inward near its flexure, almost straight from thence to its tip. Length of the body 8 lines; of the wings 12 lines.

115. *DEXIA INCLUDENS*, n. s. *Fæm.* Atra, capite apud oculos albo, palpis antennis pedibusque nigris, thorace vittis duabus cinereis, abdomine lanceolato fasciis tribus albis late interruptis, pedibus longiusculis, alis nigricanti-cinereis, halteribus testaceis.

Female. Deep black; head cinereous in front, white about the eyes; vertex narrow; frontalia widening to the face, with bristles along each side; facialia without bristles; epistoma not prominent; palpi slender; antennæ reaching the epistoma, 3rd joint narrow, linear, about four times the length of the 2nd; thorax cinereous on each side, and with two cinereous stripes; abdomen lanceolate, setose, nearly twice the length of the thorax, with three widely interrupted white bands; legs rather long; wings blackish grey; veins black; præbrachial vein forming a very obtuse and slightly rounded angle at its flexure, almost straight from thence to its tip; discal transverse vein almost straight, parted by hardly less than its length from the border, and by much more than its length from the flexure of the præbrachial; alulæ

whitish; halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

116. *DEXIA PRECEDENS*, n. s. *Fœm.* Cinerea, capite albo lateribus anticis piceis, palpis pedibusque nigris, antennis testaceis, thorace vittis tribus nigris, abdomine basi lateribus fasciaque nigris, punctis latera- libus albis, pedibus longiuseulis, alis cinereis, alulis albis.

Female. Cinereous; head white, piceous on each side in front; frontalia deep black, slightly widening to the face, with bristles along each side; facialia without bristles; epistoma not prominent; palpi and legs black; antennæ testaceous, not reaching the epistoma, 3rd joint not thrice the length of the 2nd; thorax with three black stripes, the the lateral pair abbreviated hindward; abdomen a little longer than the thorax, black and with white points along each side, black at the base and with a black band on the hind border of the 2nd segment; legs rather long; wings cinereous; veins black; præbrachial vein forming a rounded and very obtuse angle at its flexure, almost straight from thence to its tip; discal transverse vein nearly straight, parted by less than its length from the border, and by very much more than its length from the flexure of the præbrachial; alulæ white; halteres piceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. *TOROCCA*, n. g.

Fœm. *Corpus* gracile, sublineare. *Proboscis* palpique brevissimi. *Antennæ* brevissimæ, arista nuda. *Thorax* brevis. *Abdomen* longissimum, thorace plus duplo longius. *Pedes* longissimi. *Alæ* angustæ.

Female. Body slender, nearly linear. Head as broad as the thorax. Proboscis and palpi very short. Antennæ very short, not nearly extending to the epistoma; 3rd joint linear, rounded at the tip, about twice the length of the 2nd; arista bare, stout towards the base, full twice the length of the 3rd joint. Thorax short. Abdomen very elongate-fusiform, more than twice the length of the thorax. Legs very long. Wings narrow.

117. *TOROCCA ABDOMINALIS*, n. s. *Fœm.* Viridis, capite pectoreque albis, proboscide palpisque fulvis, antennis pedibusque nigris, abdomine fulvo segmentorum marginibus posticis vittaque dorsali nigris, alis nigricanti-cinereis, alulis albedo-cinereis.

Female. Green, bristly; head and pectus white; frontalia deep black, widening to the face, with a row of bristles along each side; facialia without bristles; epistoma not prominent; eyes bare; proboscis and palpi tawny; antennæ black; abdomen tawny, with a few spines; hind borders of the segments black; 1st segment black at the base, and with a broad black stripe; legs black; wings blackish cinereous; veins black; præbrachial vein forming an almost right angle, and emitting a short stump at its flexure, nearly straight from thence to its tip; discal transverse vein very undulating, parted by about half its

length from the border, and by much less than its length from the flexure of the præbrachial; alulæ whitish cinereous. Length of the body $5\frac{1}{2}$ lines; of the wings 8 lines.

Subfam. SARCOPHAGIDES, *Walk.*

Gen. SARCOPHAGA, *Meigen.*

118. *Sarcophaga invaria*, *Walk.* See Vol. III. p. 103.

119. *Sarcophaga aliena*, *Walk.* See Vol. I. p. 22.

120. SARCOPHAGA MENDAX, n. s. *Mas.* Cinerea, capite albo, palpis antennis pedibusque nigris, thorace vittisque lineisque duabus nigris, abdomine tessellato vittis tribus nigris, vittis lateralibus e strigis lanceolatis, alis cinereis, alulis albis.

Male. Cinereous; head white, clothed behind and beneath with cinereous hairs; frontalia deep black, widening towards the face; palpi and antennæ black; thorax with five black stripes, the exterior pair incomplete, the middle cinereous intervals interlined; abdomen tessellated, with three black stripes, the lateral pair forming lanceolate streaks on the 3rd and 4th segments; legs black, very stout; wings grey; veins black; præbrachial vein forming a right angle at its flexure, near which it is curved inward, and is thence almost straight to its tip; discal transverse vein slightly curved near each end, parted by much less than its length from the border, and from the flexure of the præbrachial; alulæ white. Length of the body 6 lines; of the wings 10 lines.

121. SARCOPHAGA INEXTRICATA, n. s. *Fæm.* Cinerea, capitis lateribus anticis, palpis, antennis pedibusque nigris, thorace vittis tribus lineisque duabus nigris, abdomine fasciis tribus subinterruptis albidis, alis cinereis, alulis albis.

Female. Cinereous; head with black hairs behind and beneath; frontalia black, broad, slightly widening towards the face; a deep black space on each side of the face; palpi black, rather long; antennæ rather short, not nearly reaching the epistoma, 3rd joint slightly plumose; thorax with three black stripes, the two middle cinereous intervals interlined; abdomen with three broad slightly interrupted whitish bands; legs black, very stout; wings grey; veins black, slightly blackish-bordered; præbrachial vein forming a right angle at its flexure, near which it is curved inward, and is thence straight to its tip; discal transverse vein very slightly undulating, parted by much less than its length from the border and from the flexure of the præbrachial; alulæ white. Length of the body 5 lines; of the wings $8\frac{1}{2}$ lines.

Subfam. MUSCIDES, *Walk.*

Gen. IDIA, *Meigen.*

122. *Idia australis*, *Walk.* See Vol. III. p. 103.

123. *IDIA PROLATA*, n. s. (Group *Rhyncomya*, *Desvoidy*). *Fæm.* Viridis, sat angusta, capite testaceo frontalibus facie maculisque duabus anticis nigris, antennis halteribusque testaceis, abdomine cyaneo purpureo cupreoque vario fasciis duabus aureo-viridibus, pedibus nigris, alis cinereis basi et apices versus fuscis.

Female. Green, rather narrow, with slight cinereous tomentum; head testaceous, white behind; frontalia and face black and shining, the former linear; a black spot on each side of the peristoma; epistoma rather prominent; eyes bare; antennæ testaceous, not near reaching the epistoma, 3rd joint about thrice the length of the 2nd; abdomen blue, tinged with purple and with cupreous, a little broader than the thorax, with two golden green bands which are widely interrupted above; legs black; wings grey, brown at the base and towards the tips, with the exception of the hind border; veins black; præbrachial vein forming a much rounded and very obtuse angle at its flexure, which is near the border, nearly straight from thence to its tip; discal transverse vein slightly curved outward, parted by much less than its length from the border, and by about its length from the flexure of the præbrachial; alulæ and halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

Gen. *MUSCA*, *Linn.*

124. *MUSCA PROSPERA*, n. s. (Gen. *Silbomyia*, *Macq.*). *Fæm.* Aurato-viridis, capite argenteo, facie palpis antennis pedibusque nigris, oculis nudis, pectore maculis duabus argenteis, abdomine spinoso, apice purpureo maculis duabus argenteis, alis nigricantibus basi et apud costam nigris, alulis albis. *Var. β.* Thoracis disco cupreo, abdomine subtus cyaneo-purpureo. *Var. γ.* Abdominis disco cupreo, palpis fulvis.

Female. Deep golden green, thickly beset with very stout bristles; head silvery white; vertex green on each side; frontalia piceous, very broad, with long stout bristles on each side; facialia without bristles; face black, deeply keeled, the keel partly white; epistoma slightly prominent; eyes bare; palpi long, subclavate; antennæ almost reaching the epistoma, 3rd joint full four times the length of the 2nd; pectus with a silvery spot on each side; abdomen elongate-oval, a little longer than the thorax, with long stout spines hindward, purple at the tip, where there is a silvery spot on each side; legs black, very stout; wings blackish, black at the base and along part of the costa; veins black; præbrachial vein forming a rounded right angle at its flexure, near which it is curved inward, and is thence straight to its tip; discal transverse vein undulating, parted by more than half its length from the border and by less than half its length from the flexure of the præbrachial; alulæ white. *Var. β.* Disk of the thorax bright cupreous; abdomen blue and purple beneath. *Var. γ.* Like *Var. β*; palpi tawny; disk of the abdomen bright cupreous. Length of the body 7-8 lines; of the wings 12-14 lines.

125. *MUSCA DELECTANS*, n. s. (n. subg. *Isomyia*). *Fœm.* Cuprea, capite cinereo lateribus anticis fulvis, palpis fulvis latiusculis, antennis rufescentibus, scutello aurato, viridi-abdominis fasciis pedibusque nigris, alis cinereis apud costam nigricantibus apud venas posticas subluridis, alulis albido-testaceis, halteribus fulvis.

Female. Bright cupreous, rather long; head cinereous, tawny and somewhat produced on each side of the peristoma; frontalia black, slightly widening towards the face, with a few bristles along each side; facialia without bristles; epistoma somewhat prominent; eyes bare; palpi tawny, rather broad; antennæ reddish, not near reaching the epistoma, 3rd joint about one-third of the length of the 2nd; scutellum mostly golden green; abdomen nearly oval, broader but hardly longer than the thorax, with a black band on the hind border of each segment; legs black; wings grey, blackish along the costa towards the base, slightly lurid along the hinder veins; veins black; præbrachial vein forming a slightly obtuse and rounded angle at its flexure, much curved inward from thence to its tip; discal transverse vein deeply undulating, parted by more than half its length from the border and by much more than half its length from the flexure of the præbrachial; alulæ whitish testaceous; halteres tawny. Length of the body 7 lines; of the wings 12 lines.

126. *MUSCA INGENS*, n. s. (Gen. *Calliphora*, *Desv.*). *Fœm.* Nigricanti-cyanea, valde setosa, capite albo, palpis antennis pedibusque nigris, pectore cinereo, abdomine spinoso fasciis tribus argenteis late interruptis, alis nigricantibus margine postico cinereo, alulis albidis.

Female. Blackish blue, thickly beset with long stout bristles; head white; frontalia deep black, widening in front, with a few bristles on each side; facialia beset with bristles, except towards the frontalia; palpi and antennæ black, the latter reaching the epistoma, 3rd joint six times the length of the 2nd; pectus and sides of the thorax cinereous; abdomen a little longer and broader than the thorax, with spines towards the tip, and with three broadly interrupted silvery bands; legs black; wings blackish, cinereous along the hind border and in the disks of the hinder areolets; veins black; præbrachial vein forming a right and much rounded angle at its flexure, curved inward beyond, and thence nearly straight to its tip; discal transverse vein slightly undulating, parted by less than half its length from the border, and by full half its length from the flexure of the præbrachial; alulæ whitish. Length of the body 9 lines; of the wings 14 lines.

127. *MUSCA PROMITTENS*, n. s. (Gen. *Ochromyia*, *Macq.*). *Mas et Fœm.* Fulva, capite albo, palpis testaceis, tibiis supra tarsisque apice piceis, alis cinereis basi luridis. *Fœm.* Abdomine purpurascenti-cyaneo basi fulvo.

Male and Female. Tawny with black bristles; head white; frontalia

piceous, linear, with a few bristles along each side; facialia without bristles; epistoma rather prominent; eyes bare; palpi testaceous; antennæ almost reaching the epistoma, 3rd joint four times the length of the 2nd; abdomen of the female purplish blue, tawny towards the base, broader but not longer than the thorax; tibiæ above, and tarsi towards the tips, piceous; wings grey, lurid towards the base; veins black, tawny towards the base; præbrachial vein forming a right and much rounded angle at its flexure, much curved inward from thence to its tip; discal transverse vein undulating, long, parted by more than half its length from the border, and by less than its length from the flexure of the præbrachial; alulæ testaceous. Length of the body 4-5 lines; of the wings 8-10 lines.

128. *MUSCA FAVILLACEA*, n. s. (n. subg. *Anisomyia*). *Fœm.* Fulva, longiuscula, capite antico palpisque testaceis, antennis cinereo-fulvis, thorace vittis tribus cinereis, abdomine nigro basi testaceo fasciis tribus argenteo-cinereis, alis cinereis. *Var. β.* Thorace cinereo, abdomine fulvo cinereo-tessellato segmentis nigro marginatis.

Female. Tawny, rather long, with black bristles; head testaceous in front, whitish and with whitish hairs beneath and hindward; frontalia extremely broad, with a cinereous line, beset with six bristles along each side; facialia without bristles; epistoma prominent; eyes bare; palpi testaceous; antennæ greyish tawny, reaching the epistoma, 3rd joint four times the length of the 2nd; thorax with three indistinct cinereous stripes; abdomen black, elongate-oval, a little longer and broader than the thorax, with a testaceous basal band, and with three silvery grey bands which are testaceous beneath, ventral segments wholly testaceous; wings cinereous; veins black, tawny towards the base; præbrachial vein forming a rounded and obtuse angle at its flexure, slightly curved inward from thence to its tip; discal transverse vein slightly undulating, parted by a little more than half its length from the border, and from the flexure of the præbrachial; alulæ testaceous. *Var. β.* Thorax cinereous; abdomen tawny, tessellated with cinereous, hind borders of the segments black. Length of the body 5-6 lines; of the wings 10-12 lines.

129. *Musca obtrusa*, Walk. See Vol. III. p. 105.

130. *Musca flaviceps*, Macq. See Vol. I. p. 23.

131. *MUSCA SELECTA*, n. s. (Gen. *Lucilia*, Desv.). *Fœm.* Aureo-viridis, longiuscula, capite testaceo, epistomate elevato, palpis fulvis, antennis pallide rufis, thorace vittis tribus cupreis, pedibus nigris, alis nigricanti-cinereis margine postico cinereo, alulis albidis testaceo marginatis, halteribus fulvis.

Female. Bright golden green, rather long; head testaceous, cinereous and with whitish hairs behind and beneath; frontalia deep black, linear, thickly beset with bristles along each side; epistoma prominent; palpi

tawny; antennæ pale red, not near reaching the epistoma, 3rd joint less than thrice the length of the 2nd; thorax with three slender bright cupreous stripes; abdomen wanting; legs black; wings blackish grey, grey along the hind border; veins black; præbrachial vein forming a very obtuse and much rounded angle at its flexure, slightly curved inward between the flexure and the tip; discal transverse vein undulating, parted by more than half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ whitish, with testaceous borders; halteres tawny. Length of the body 5 lines; of the wings 10 lines.

132. *MUSCA SPERATA*, n. s. (Gen. *Lucilia*, *Desv.*). *Mas.* Aureo-viridis, capite nigro-cinereo, proboscide palpis antennis pedibusque nigris, thoracis disco cupreo, alis cinereis basi et apud costam sub-luridis, alulis obscure cinereis.

Male. Golden green; head cinereous black; eyes bare; proboscis, palpi, and antennæ black, the latter not reaching the epistoma; disk of the thorax bright cupreous; abdomen shorter than the thorax; legs black; wings grey, with a lurid tinge at the base and along part of the costa; veins black; præbrachial vein forming a rounded and very obtuse angle at its flexure, hardly curved inward from thence to its tip; discal transverse vein very slightly curved inward behind the middle, parted by much less than its length from the border, and by hardly less than its length from the flexure of the præbrachial; alulæ dark grey. Length of the body 4 lines; of the wings 8 lines.

133. *MUSCA INSCRIBENS*, n. s. (Gen. *Chrysomyia*, *Desv.*). *Fæm.* Aureo-viridis, capite albo, palpis fulvis, antennis piceis, abdomine segmentorum marginibus pedibusque nigris, alis cinereis basi nigricantibus, alulis cinereo-albis.

Female. Deep bright green; head white; frontalia black, linear; palpi tawny; antennæ piceous, nearly reaching the epistoma; abdomen almost as long as the thorax, hind borders of the segments black; legs black; wings grey, blackish at the base; veins black; præbrachial vein forming an obtuse and rounded angle at its flexure, hardly curved inward from thence to its tip; discal transverse vein nearly straight, parted by little more than half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ cinereous with white borders, the upper pair white. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

134. *MUSCA ELECTA*, n. s. (Gen. *Lucilia*, *Desv.*). *Mas et Fæm.* Viridis, capite albo, palpis antennis pedibusque nigris, alis cinereis, alulis albido-cinereis. *Fæm.* Frontis lateribus nigris. *Var. β, Mas.* Aureo-viridis.

Male and Female. Bright green; head white, that of the female black and shining on each side of the broad dull black frontalia; antennæ black, nearly reaching the epistoma; abdomen a little broader and shorter than the thorax; legs black; wings grey; veins black; præ-

brachial vein forming a very obtuse and much-rounded angle at its flexure, almost straight from thence to the border; discal transverse vein slightly curved inward in the middle, parted by much less than its length from the border, and by hardly less than its length from the flexure of the præbrachial; alulæ whitish cinereous; lower alulæ of the male dark cinereous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Male, Var. β. Golden-green; the four alulæ dark cinereous.

135. *MUSCA FORTUNATA*, n. s. (Gen. *Chrysomyia*, *Desv.*). *Mas.* Subaurato viridis, capite albo, palpis fulvis, antennis piceis, abdomine segmentorum marginibus posticis cyaneis, pedibus nigris, alis obscure cinereis basi nigricantibus, alulis albidis.

Male. Bright green, slightly gilded; head white; eyes not contiguous; frontalia black, narrow, linear; palpi tawny; antennæ piceous, nearly reaching the epistoma; abdomen not longer than the thorax, hind borders of the segments dark blue; legs black; wings dark grey, blackish at the base; veins black; præbrachial vein forming an obtuse and slightly-rounded angle at its flexure, almost straight from thence to its tip; discal transverse vein hardly undulating, parted by little more than half its length from the border, and by much more than half its length from the flexure of the præbrachial; alulæ whitish. Length of the body $3-3\frac{1}{2}$ lines; of the wings 6-7 lines.

136. *MUSCA INTRAHENS*, n. s. (Gen. *Lucilia*, *Desv.*). *Fæm.* Cyanescenti-viridis, capite albo, palpis antennis pedibusque nigris, alis cinereis, alulis obscure cinereis, halteribus testaceis.

Female. Bright bluish green; head white; frontalia dull black; palpi, antennæ, and legs black; abdomen not longer than the thorax; legs black; wings grey; veins black; præbrachial vein forming a rounded and very obtuse angle at its flexure, straight from thence to its tip; discal transverse vein hardly bent inward, parted by more than half its length from the border, and by about its length from the flexure of the præbrachial; alulæ dark cinereous; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

This species very much resembles *M. electa*, but may be distinguished by its narrower body and by some slight differences in the veins of the wings.

137. *MUSCA OPTATA*, n. s. (Gen. *Pyrellia*, *Desv.*). *Mas.* Viridis, capite albido, palpis antennis pedibusque nigris, alis cinereis, alulis cinereis testaceo marginatis.

Male. Bright green; head whitish in front; palpi and antennæ black; abdomen a little broader and shorter than the thorax; legs black; wings cinereous; veins black; præbrachial vein forming a gentle curve at the flexure, straight from thence to the tip; discal transverse vein straight, parted by much more than half its length from the border,

and by about its length from the flexure of the præbrachial; alulæ cinereous, with testaceous borders. Length of the body $3-3\frac{1}{2}$ lines; of the wings 6-7 lines.

138. *MUSCA PROFERENS*, n. s. (Gen. *Pyrellia*, *Desv.*). *Mas.* *Nigricanti-viridis*, palpis antennis pedibusque nigris, alis cinereis, alulis obscure cinereis, halteribus apice pallidis.

Male. Blackish-green, shining; eyes contiguous; palpi and antennæ black, the latter nearly reaching the epistoma; abdomen a little broader and shorter than the thorax; legs black; wings cinereous; veins black; præbrachial vein forming a gentle curve at its flexure, straight from thence to its tip; discal transverse vein straight, parted by more than half its length from the border, and hardly more than its length from the flexure of the præbrachial; alulæ dark cinereous; halteres with pale knobs. Length of the body 3 lines; of the wings 6 lines.

139. *Musca refixa*, *Walk.* See Vol. I. p. 26.

140. *MUSCA GAVISA*, n. s. (n. subg. *Neomyia*). *Fæm.* *Purpurea*, pubescens, capite nigro, facie subobliqua, palpis antennis pedibusque nigris, abdomine lato crasso, alis fusciscenti-cinereis basi nigricantibus, alulis obscurioribus. *Var. β.* *Viridescenti-cyanea*, scutello purpureo.

Female. Brilliant purple; head black, shining, narrower than the thorax; frontalia dull, linear; face slightly oblique; palpi and antennæ black, the latter not reaching the epistoma; thorax and abdomen with thick black pubescence; abdomen very thick, shorter and much broader than the thorax; legs black; wings brownish grey, blackish at the base; veins black; præbrachial vein forming a much-rounded and very oblique curve at its flexure, hardly curved inward from thence to its tip; discal transverse vein hardly undulating, parted by much more than half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ dark brownish grey. *Var. β.* Bright greenish blue; scutellum purple. Length of the body 5 lines; of the wings 10 lines.

141. *Musca domestica*, *Linn.* See Vol. I. p. 128.

142. *MUSCA CONDUCENS*, n. s. *Mas.* *Cinerea*, capite albo, palpis antennis pedibusque nigris, thorace vittis duabus latis nigris, abdomine testaceo linea dorsali nigra basi apiceque cinereo-nigris, alis cinereis.

Male. Cinereous; head white; eyes bare; palpi slender, subclavate; antennæ not reaching the epistoma; thorax with two broad black stripes; abdomen dull testaceous, cinereous black at the base and towards the tip, and with a black dorsal line; wings cinereous; veins black; præbrachial vein forming a rounded and very obtuse angle at its flexure, slightly curved inward from thence to its tip; discal transverse vein curved inward, parted by full half its length from the border, and by a little more than its length from the flexure of the præ-

brachial; alulæ cinereous. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

143. *MUSCA XANTHOMELA*, n. s. *Fem.* Nigra, capite albido, abdomine ochraceo, alis subcinerascentibus, halteribus pallide testaceis.

Female. Black; head whitish about the eyes, which are red and bare; antennæ not reaching the epistoma; abdomen ochraceous, a little shorter than the thorax; wings slightly greyish; veins black, testaceous towards the base; præbrachial vein forming an obtuse angle at the flexure, straight from thence to the border; discal transverse vein straight, parted by less than its length from the border, and by more than its length from the flexure of the præbrachial; halteres pale testaceous. Length of the body $2\frac{1}{4}$ lines; of the wings 4 lines.

144. *MUSCA PRÆDICENS*, n. s. (*Gen.* *Graptomyza*, *Desv.*). *Fem.* Nigra, capite albido-cinereo, palpis antennis pedibusque nigris, thorace vittis quatuor albido-cinereis, abdomine testaceo maculis nigris, alis cinereis, halteribus testaceis.

Female. Black; head whitish cinereous; frontalia deep black, linear, with bristles along each side; facialia without bristles; epistoma not prominent; proboscis and palpi black; antennæ reaching the epistoma, 3rd joint about four times the length of the 2nd; thorax with four stripes, metathorax and pectus whitish cinereous; abdomen testaceous; four black spots on each segment excepting the 1st; legs black; wings cinereous; veins black, testaceous towards the base; præbrachial vein forming a curve at its flexure, which is very near the border; discal transverse vein almost straight, parted by little more than half its length from the border, and by more than its length from the flexure of the præbrachial; alulæ and halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

145. *MUSCA COLLECTA*, n. s. *Mas.* Viridis, cinereo tomentosa, capite albo antice testaceo, palpis antennisque fulvis, abdomine testaceo apice viridi linea dorsali nigra, pedibus nigris, tibiis obscure fulvis, alis cinereis, halteribus testaceis.

Male. Green, with cinereous tomentum; head white, testaceous and rather prominent in front; eyes bare, contiguous; epistoma slightly prominent; proboscis black; palpi tawny; antennæ tawny, not near reaching the epistoma, 3rd joint not more than twice the length of the 2nd; arista simple, more than twice the length of the 3rd joint; abdomen testaceous, green towards the tip, with a black dorsal line; legs black; tibiæ dark tawny; wings grey; veins black, testaceous towards the base; præbrachial vein forming a very obtuse and much-rounded angle at its flexure, from whence it is hardly curved inward to its tip; discal transverse vein curved outward, parted by much more than half its length from the border, and by hardly less than its length from the flexure of the præbrachial; alulæ pale cinereous, with testaceous borders; halteres testaceous. Length of the body $2\frac{3}{4}$ lines; of the wings 5 lines.

Subfam. ANTHOMYIDES, *Walk.*Gen. ARICIA, *Macq.*

146. *Aricia significans*, *Walk.* See Vol. III. p. 107.

147. *ARICIA CONTRARIA*, n. s. *Mas et Fæm.* Picea, capite argenteo, palpis pedibusque nigris, antennis testaceis, scutello fulvo, abdomine nigro, alis cinereis basi et apud costam subluridis.

Male and Female. Piceous, head silvery about the eyes; frontalia dull black; palpi and legs black; antennæ testaceous, reaching the epistoma, 3rd joint about four times the length of the 2nd; thorax with four indistinct cinereous stripes; scutellum tawny; abdomen black, shining, a little broader but not longer than the thorax; wings grey, rather broad, with a lurid tinge towards the base and along the costa; veins black, tawny towards the base; discal transverse vein hardly undulating, or slightly curved inward, parted by much more than its length from the præbrachial, and by much less than its length from the border. Length of the body 3-4 lines; of the wings 6-8 lines.

148. *ARICIA INTEGRÆ*, n. s. *Mas.* Testaceo-cinerea, capite albo, palpis nigris, antennis testaceis basi nigris, thorace lineis quatuor nigris postice obsoletis, pedibus fulvis, tarsis piceis, alis cinereis apud costam subluridis, halteribus testaceis.

Male. Testaceous-cinereous; head white; frontalia deep black, widening in front; palpi black; antennæ testaceous, black at the base, nearly reaching the epistoma, 3rd joint about four times the length of the 2nd; thorax with four black lines which are obsolete hindward; abdomen nearly oval, not longer than the thorax; legs tawny; tarsi piceous; wings grey, with a slight lurid tinge towards the costa; veins black; discal transverse vein curved inward towards the base, parted by about its length from the præbrachial transverse, and by much less than its length from the border; alulæ and halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

149. *ARICIA NIGRICOSTA*, n. s. *Mas et Fæm.* Cinerea, capite argenteo, palpis nigris, antennis piceis, thorace vittis quatuor nigris, abdomine maculis quatuor nigris, pedibus fulvis, alis cinereis apud costam subluridis, costa nigra.

Male and Female. Cinereous; head silvery white; palpi black; antennæ piceous, tawny at the base, reaching the epistoma, 3rd joint about four times the length of the 2nd; thorax with four black stripes; abdomen nearly oval, not longer than the thorax, 2nd and 3rd segments with two black spots on each; legs tawny; tarsi black; wings cinereous, with a lurid tinge along the costa, which is black; veins black, tawny towards the base; discal transverse vein slightly bent inward, parted by about its length from the præbrachial transverse, and by much less than its length from the border. Length of the body 4 lines; of the wings 8 lines.

Gen. SPILOGASTER *Macq.*

150. SPILOGASTER XANTHOCERAS, n. s. *Fem.* Alba, capite argenteo, palpis pedibusque nigris, antennis pallide testaceis basi nigris, thoracis fascia lata scutelloque nigris, thorace vitta fasciisque duabus nigris, alis cinereis apud costam subluridis.

Female. White; head silvery white; frontalia broad, deep black; proboscis, palpi, and legs black; antennæ pale testaceous, reaching the epistoma, black at the base, 3rd joint about four times the length of the 2nd; thorax with a broad black band; scutellum black; abdomen cinereous, elongate, with a slender black stripe and with two black bands; wings cinereous, with a lurid tinge along the costa; veins black, tawny towards the base; discal transverse vein bent inward towards the base, parted by hardly more than its length from the præbrachial transverse, and by much less than its length from the border; alulæ white. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Gen. ANTHOMYIA, *Meigen.*

151. Anthomyia procellaria, *Walk.* See Vol. III. p. 108.

Gen. LISPE, *Meigen.*

152. LISPE BIMACULATA, n. s. *Fem.* Nigra, capite atro antice aurato subtus albido, pectore pedibusque cinereis, abdomine vitta cinerea maculis duabus subapicalibus albis, femoribus intermediis basi dilatatis, alis cinereis, halteribus testaceis.

Female. Black; head deep black above, gilded in front, whitish on each side beneath; pectus and legs cinereous; abdomen with a slender cinereous stripe, and with a white spot on each side near the tip; knees pale; middle femora dilated at the base; wings cinereous; veins black, tawny at the base; discal transverse vein parted by less than its length from the border, and by about twice its length from the præbrachial transverse; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Gen. CÆNOSIA, *Meigen.*

153. CÆNOSIA LUTEICORNIS, *Walk.* (see Vol. III. p. 108). *Fem.* Cana, capite aurato, frontalibus pedibusque fulvis, palpis albis, antennis pallide luteis, abdomine subtestaceo apice cano maculis quatuor nigris, alis cinerascensibus, halteribus testaceis.

This is probably the female of *C. luteicornis*, though the wings have no trace of an apical spot.

Female. Hoary; head pale gilded, hoary behind and beneath; frontalia tawny, widening slightly in front; palpi white; antennæ pale luteous, reaching the epistoma, 3rd joint linear, rounded at the tip, six times the length of the 2nd; arista plumose to full half its length; abdomen dull testaceous, hoary towards the tip, where it is very bristly

above, 3rd and 4th segments with a black dorsal spot on each, 4th and 5th segments with a black spot on each side; legs tawny; tarsi piceous; wings greyish; veins black, testaceous at the base; discal transverse vein parted by a little less than its length from the border, and by much more than its length from the præbrachial transverse; alulæ pale cinereous; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

154. *CÆNOSIA SIGNATA*, n. s. *Fæm.* Cinereo-fulva, capite antennis pedibus halteribusque testaceis, thoracis vittis quatuor scutelli disco abdominisque vitta nigris, alis cinereis subluridis.

Female. Cinereous-tawny; head testaceous, white about the eyes; antennæ testaceous, not near reaching the epistoma, 3rd joint elongate-conical, about twice the length of the 2nd; arista plumose to the tip; thorax with four black stripes, the outer pair interrupted; disk of the scutellum black; abdomen with a black stripe, which is interrupted on the hind border of each segment; legs testaceous; wings grey with a slight lurid tinge; veins tawny, costal vein black, discal transverse vein parted by little more than half its length from the border, and by about twice its length from the præbrachial transverse; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

155. *CÆNOSIA RESPONDENS*, n. s. *Fæm.* Cana, capite apud oculos albo, palpis albidis, antennis halteribusque testaceis, thorace lineis tribus nigris, abdomine subfusiformi e maculis nigris trivittato, pedibus nigris, femoribus apice tibiisque fulvis, alis cinereis, alulis albis.

Female. Hoary; head white about the eyes; frontalia reddish; palpi whitish; antennæ testaceous, 3rd joint long, slender, nearly reaching the epistoma; thorax with three black lines; abdomen nearly fusiform, a little longer than the thorax, with three black spots on each segment, legs black, femora towards the tips and tibiæ tawny; wings grey; discal transverse vein parted by about twice its length from the præbrachial transverse, and by about its length from the border; alulæ white; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Subfam. HELOMYZIDES, *Fallen.*

Gen. *XARNUTA*, *Walk.*

156. *Xarnuta leucotelus*, *Walk.* See Vol. I. p. 28.

Gen. *CORDYLURA*, *Fallen.*

157. *CORDYLURA BISIGNATA*, n. s. *Mas.* Nigra, vix nitens, antennis breviusculis, arista pubescente, abdomine cylindrico maculis duabus lateralibus albis, pedibus non spinosis, alis obscure cinereis, alulis albis.

Male. Black, hardly shining; head white behind, testaceous towards the epistoma; antennæ not near reaching the epistoma, 3rd joint

linear, rounded at the tip, full twice the length of the second; arista pubescent; abdomen cylindrical, a little longer than the thorax, with a white spot on each side in the middle; legs unarmed, moderately long; wings dark grey; veins black; discal transverse vein straight, upright, parted by a little less than its length from the border, and by full twice its length from the præbrachial transverse; alulae white. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Gen. HELOMYZA, *Fallen.*

158. HELOMYZA OBSERVANS, n. s. *Mas.* Fulva, antennarum articulo 3^o conico brevi, arista plumosa, abdomine guttis quatuor dorsalibus nonnullisque ventralibus nigris, segmentis albido marginatis, alis subcinereis.

Male. Tawny, with a few black bristles; antennæ short, 3rd joint conical, less than twice the length of the 2nd; arista plumose; abdomen conical, not longer than the thorax, hind borders of the segments whitish, fourth segment with a black dot, fifth segment with three black dots, some black dots along each side beneath; wings greyish; veins black, testaceous at the base; discal transverse vein straight, upright, parted by full half its length from the border, and by nearly twice its length from the præbrachial transverse. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

159. HELOMYZA TRIPUNCTIFERA, n. s. *Fæm.* Fulva, antennarum articulo 3^o conico, arista plumosa, abdomine fasciis pallidis guttaque apicali atra, alis cinereis antice subluridis.

Female. Tawny, with black bristles; head whitish about the eyes; third joint of the antennæ conical, hardly twice the length of the 2nd; arista plumose to the tip; abdomen with a pale band on the hind border of each segment, and with a black apical dot; wings grey, with a lurid tinge in front; veins black; discal transverse vein straight, upright, clouded with brown, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse. Length of the body 2 lines; of the wings 4 lines.

160. HELOMYZA COPIOSA, n. s. *Fæm.* Cinerea, capite vitta testacea, antennis fulvis brevissimis basi nigris, arista plumosa, thorace maculis plurimis fuscis, scutello fulvo basi nigro, abdomine nigro vitta et segmentorum marginibus posticis fulvis, tibiis fulvo cinctis, alis cinereis nigricante maculatis.

Female. Cinereous; head slightly ferruginous, with a dull testaceous stripe on the front, whitish about the eyes; epistoma not prominent; antennæ tawny, black towards the base, very short, not extending beyond half the length of the face, 3rd joint conical, much longer than the 2nd; arista plumose; thorax with three rows of various brown spots; scutellum tawny, black at the base; pectus with brown spots; abdomen black, oval, not longer than the thorax, with a stripe

and the hind borders of the segments tawny: legs black, short; tibiæ tawny, black at the base and at the tips: wings grey, slightly lurid in front, with numerous partly confluent blackish spots; veins black; discal transverse vein straight, upright, parted by much less than its length from the border, and by about twice its length from the præbrachial transverse; halteres tawny. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. SCIOMYZA, *Fallen*.

161. SCIOMYZA REPLENA, n. s. *Fæm.* Picea, capite ferrugineo lituris albis, antennis pedibus thoracisque vittis quatuor rufescentibus, abdomine nigro fasciis rufescentibus, femoribus nigris, tibiis nigro bifasciatis, alis nigricantibus albido trifasciatis margine postico cinereo.

Female. Piceous; head with several black bristles, white about the eyes, ferruginous above, with a white transverse line hindward, with a partly black partly white mark on each side, and with an abbreviated whitish streak in the middle; antennæ reddish, piceous towards the tips, 3rd joint conical, less than twice the length of the 2nd; arista plumose; thorax with four reddish stripes, the outer pair incomplete; abdomen black, with a reddish band on the fore border of each segment; legs reddish, femora black, tibiæ with two black bands; wings blackish, with three irregular abbreviated whitish bands, cinereous along the hind border; veins black; discal transverse vein straight, upright, parted by less than its length from the border, and by nearly twice its length from the præbrachial transverse; halteres testaceous. Length of the body $2\frac{3}{4}$ lines; of the wings 5 lines.

162. SCIOMYZA? LEUCOMELANA, n. s. *Fæm.* Picea, nitens, subtus alba, capite plano, antennis rufis apice nigris, arista plumosa, abdomine nigro, pedibus halteribusque testaceis, alis nigricantibus acutis.

Female. Piceous, shining; head flat above, a little narrower than the thorax; epistoma, sides of the peristoma, under side and disk of the pectus white; antennæ red, reaching the epistoma, third joint elongate-conical, black towards the tip; arista plumose; scutellum large; abdomen oval, black, hardly longer or broader than the thorax; legs short, testaceous; wings blackish, paler along the hind border, rather pointed at the tips; costa very convex; veins black, radial vein slightly curved, cubital vein and præbrachial vein converging towards the tip; discal transverse vein nearly straight and upright, parted by more than its length from the border, and by nearly twice its length from the præbrachial transverse; halteres testaceous. Length of the body 2 lines; of the wings 4 lines.

Gen. AMBLADA, n. g.

Fæm. Corpus sat robustum. Caput transversum, thorace vix angustius. Antennæ capitis latitudine breviores; articulus 3^{us} lanceolatus,

2° longior; arista pubescens. *Abdomen* brevi-ovatum, thorace multo brevius. *Pedes* simplices. *Alæ* mediocres.

Female. Body moderately stout. Head transverse, almost as broad as the thorax, somewhat flat above; proboscis and palpi very short. Antennæ shorter than the breadth of the head; 3rd joint lanceolate, longer than the 2nd; arista pubescent. Abdomen short-oval, much shorter than the thorax. Legs simple, moderately long. Wings of moderate size; veins of the usual structure.

163. *AMBLADA ATOMARIA*, n. s. *Fam.* Cinerea, capite guttis quatuor fuscis maculisque duabus atris, arista alba filiformi, thorace lineis duabus punctisque plurimis fuscis, abdomine fulvo segmentorum marginibus nigro punctatis, pedibus fulvis, tibiis albidis nigro bifasciatis, alis lurido-cinereis.

Female. Cinereous; head white about the eyes, with two brown dots on each side of the vertex, and with a deep black spot on each side in front; antennæ cinereous-brown; arista white, filiform, seated on the base of the 3rd joint, which it much exceeds in length; thorax with two slender brown lines and with very numerous brown points; abdomen tawny, with black points on the hind borders of the segments; legs tawny; tibiæ dingy whitish, with two black bands on each; wings grey, with a lurid tinge; veins tawny, black by the costa at the base; discal transverse vein straight, upright, parted by less than its length from the border, and by full twice its length from the præbrachial transverse; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Gen. SEPEDON, Latr.

164. *Sepedon Javanensis*, Desv. *Essai Myod.* 677. 2.

Inhabits also Java.

Subfam. LAUXANIDES, Walk.

Gen. LONCHÆA, Fallen.

165. *LONCHÆA? PUNCTIPENNIS*. *Fam.* Nigra, nitens, capite antico argenteo, antennarum articulo 3, longe-conico, arista plumosa, tarsis halteribusque piceis, alis cinereis basi nigris puncto costali nigro.

Female. Black, shining, with several stout bristles; head silvery in front; face flat; antennæ short; third joint elongate-conical, arista very plumose; abdomen oval, convex, a little shorter and narrower than the thorax; tarsi and halteres piceous; wings grey, black at the base, with a black costal point at the tip of the subcostal vein; veins yellowish, black at the base; costal vein black; discal transverse vein straight, upright, parted by less than its length from the border, and by nearly twice its length from the præbrachial transverse. Length of the body $2\frac{1}{4}$ lines; of the wings $4\frac{1}{2}$ lines.

166. *LONCHŒA*? *CONSENTANEA*, n. s. *Fæm.* Nigra, nitens, arista nuda, abdomine cyanescente-nigro, alis cinereis, halteribus albis.

Female. Black, shining; antennæ black, nearly reaching the epistoma; 3rd joint linear, about thrice the length of the 2nd; arista simple; abdomen bluish black; wings grey; veins black, testaceous at the base; discal transverse vein straight, upright, parted by less than its length from the border and by more than twice its length from the præbrachial transverse; halteres white. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

167. *LONCHŒA*? *ATRATULA*, n. s. *Fæm.* Atræ, pubescens, antennis epistoma attingentibus, arista plumosa, abdomine subovato, alis nigricantibus.

Female. Deep black, pubescent, not shining; antennæ reaching the epistoma; 3rd joint linear, rounded at the tip, about four times the length of the 2nd; arista plumose; abdomen somewhat oval, a little broader but hardly longer than the thorax; wings blackish; veins black; discal transverse vein straight, upright, parted by less than its length from the border, and by about twice its length from the præbrachial transverse. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Gen. *THRESSA*, n. g.

Fæm. *Corpus* breve, crassum. *Caput* thorace multo latius. *Oculi* magni. *Antennæ* epistoma fere attingentes; articulus 3^{us} linearis, 2^o plus duplo longior; arista plumosa. *Abdomen* subovatum, thorace non longius. *Pedes* longiusculi. *Alæ* parvæ.

Female. Body short, thick. Head much broader than the thorax; front wide. Eyes large. Antennæ nearly reaching the epistoma; 3rd joint linear, rounded at the tip, more than twice the length of the 2nd; arista plumose. Thorax a little longer than broad; scutellum rather prominent. Abdomen nearly oval, not longer than the thorax. Legs rather short. Wings small; costal vein ending at the tip of the wing; radial vein very near the costa; cubital vein ending at a little in front of the tip; transverse veins much retracted, very short.

168. *THRESSA* *SIGNIFERA*, n. s. *Fæm.* Nigra, nitens, capite cyaneo, antennis pedibusque fulvis, thorace strigis duabus lateralibus albis, femoribus nigris, alis hyalinis apud costam nigris, halteribus albis. *Var. β.* Alis apud costam hyalinis macula apicali nigra.

Female. Black, shining; head blue; antennæ tawny; thorax with a white transverse streak on each side; legs tawny; femora black, with tawny tips; wings hyaline, black along the costa; veins black; discal transverse vein parted by four times its length from the border, and by six times its length from the præbrachial transverse; halteres white. *Var. β.* Wings not black along the costa, with the exception of a black apical spot. Length of the body $1\frac{1}{2}$ line; of the wings $2\frac{1}{2}$ lines.

Gen. OCHTHIPHILA, *Fallen.*

169. OCHTHIPHILA DISCOGLAUCA, n. s. *Fam.* Fusca, capite thoracisque disco glucescente-albidis, arista plumosa, thorace lineis duabus lateralibus albidis, abdomine lineis transversis vittaque albidis, tibiis tarsisque rufescentibus, alis cinereis, halteribus testaceis.

Female. Brown; head glaucous-whitish; antennæ black, nearly reaching the epistoma; third joint conical, arista plumose; thorax with a very broad glaucous-whitish stripe, a whitish line on each side and two on each side of the pectus; abdomen oval, a little shorter than the thorax, with a whitish band on the hind border of each segment and with a whitish stripe, the whitish hue appearing tawny in some aspects; tibiæ and tarsi reddish; wings grey; veins black; discal transverse vein straight, upright, parted by much less than its length from the border, and by nearly twice its length from the præbrachial transverse; halteres testaceous. Length of the body 2 lines; of the wings 4 lines.

Gen. CELYPHUS, *Dalman.*

170. Celyphus obtectus, *Dalman.* See Vol. I. p. 30.

171. Celyphus scutatus, *Wied.* See Vol. I. p. 131.

Subfam. ORTALIDES, *Haliday.*Gen. LAMPROGASTER, *Macq.*

172. Lamprogaster marginifera, *Walk.* See Vol. II. p. 111.

Gen. PTEROGENIA *Bigot, MSS.*

Mas et Fam. *Platystomati* affinis. Corpus breve, latum, crassum. Caput thorace latius, antice planum, genis dilatatis. Antennæ parvæ; articulus 3^{us} longi-conicus; arista plumosa. Thorax subconvexus; scutellum magnum. Abdomen thorace brevius et angustius. Pedes breves, validi; tibiæ arcuatæ. Alæ sat parvæ; alulæ maximæ. Mas. Genæ angulatæ, valde dilatatæ.

This genus is allied to *Platystoma*, and more especially to *Trigonosoma*. *Male and Female.* Body short, broad, thick. Head broader than the thorax, flat in front; vertex broad; sides of the face or genæ dilated; epistoma rather prominent. Eyes oblong. Antennæ small, resting in the cavity of the broad face; 3rd joint elongate-conical, more than twice the length of the 2nd; arista plumose. Thorax compact, slightly convex; scutellum large, conical. Abdomen short, conical, shorter and narrower than the thorax. Legs short, stout; tibiæ curved, especially the hind pair. Wings rather small; alulæ very large. *Male.* Sides of the face more dilated than those of the female, and forming an angle or short horn on each side.

173. PTEROGENIA SINGULARIS, *Bigot, MSS.* *Mas et Fam.* Nigra, nitens, capite flavescente-albo fasciis quatuor nigris, antennis pallide

luteis basi nigris, abdominis segmentis flavo marginatis, tarsis albis apice nigris, alis subcinereis dimidio basali lutescente fasciis contiguus fuscis, fascia strigisque exterioribus fuscis, halteribus fulvis.

Male and Female. Black, shining. Head yellowish-white, with four black bands; 1st band on the vertex, broader than the others; 2nd across the base of the antennæ; 3rd in front of the face; 4th on the epistoma; antennæ pale luteous, black at the base; hind borders of the abdominal segments yellow; sides dark tawny towards the base; legs pubescent; tarsi white, with black tips; wings slightly cinereous; basal half somewhat luteous, with several partly confluent brown bands, exterior part with one brown band and with several transverse brown streaks; veins black, pale luteous exteriorly; discal transverse vein slightly curved outward, parted by about one-third of its length from the border, and by more than its length from the præbrachial transverse; alulæ white; halteres tawny. Length of the body 3 lines; of the wings 7 lines.

Gen. PLATYSTOMA, *Latr.*

174. *PLATYSTOMA ATOMARIUM*, n. s. *Mas.* Cinereum, nigro pulverosum, facie alba nigro biguttata, antennis pedibusque nigris, arista plumosa, pectore albedo, alis nigricantibus guttis plurimis limpidis.

Male. Cinereous; head flat above, white about the eyes; face white, with a black dot on each side in front; antennæ black, nearly extending to the peristoma; 3rd joint linear, rounded at the tip, more than twice the length of the 2nd; arista plumose; thorax with numerous lines of minute black points; pectus whitish, with black points; abdomen oval, powdered with black, not longer than the thorax; legs short, stout, black; wings blackish, covered with limpid dots, excepting a narrow oblique band on the transverse veins; veins black; discal transverse vein straight, upright, parted by less than half its length from the border, and by a little more than half its length from the præbrachial transverse. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

175. *PLATYSTOMA BASALE*, n. s. *Fæm.* Cinerea, capite lineis tribus albidis, antennis basi nigris, arista plumosa, thorace vittis indistinctis fuscis maculisque lateralibus nigris testaceo-marginatis, scutello nigro vitta cinerea, abdominis segmentis albido-marginatis, femoribus anticis tibiisque albedo fasciatis, alis subcinereis lituris transversis fascia exteriori costam versus dilatata fasciaque subapicali nigricantibus, halteribus albis.

Female. Cinereous; head white about the eyes and beneath, and with three whitish lines on the front; epistoma not prominent; proboscis large; antennæ black towards the base, not near reaching the epistoma; 3rd joint elongate-conical, about twice the length of the 2nd; arista plumose; thorax with indistinct brown stripes, and on each side

with black shining testaceous-bordered spots; scutellum black, shining, with a cinereous stripe; abdomen cinereous-black, oval, tawny on each side at the base, a little shorter and narrower than the thorax; hind borders of the segments whitish; legs black; tibiæ and fore femora with a whitish band on each; wings slightly greyish, with several irregular transverse blackish marks near the base, with a broad exterior blackish band, which is dilated and contains a whitish streak towards the costa, and with an irregular subapical blackish band; veins black; discal transverse vein nearly straight and upright, parted by more than half its length from the border, and by nearly twice its length from the præbrachial transverse; halteres white. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Gen. DACUS, *Fabr.*

176. DACUS DIVERGENS, n. s. *Mas.* Purpureus, longus, angustus; fronte tumida, facie carinata fulvo maculata, palpis fulvis, antennis piceis, arista alba subpubescente, thorace vittis tribus cinereis, abdomine fusiformi apicem versus cylindrico et cyaneo, pedibus piceo-nigris, femoribus fulvis, tarsis posticis rufescentibus, alis cinereis apices versus et apud venas transversas fuscis, halteribus albido-flavis.

Male. Bluish purple, long, slender; head whitish about the eyes; front tumid, convex; face keeled, with a large elongated tawny spot; palpi tawny; antennæ piceous, reaching the epistoma, tawny at the base; 3rd joint linear, conical at the tip, six times the length of the 2nd; arista white, minutely pubescent, very much longer than the 3rd joint; thorax slightly compressed, with three cinereous stripes; pectus cinereous; abdomen fusiform, cylindrical, and mostly blue towards the tip, very much longer than the thorax; legs piceous black; femora tawny; hind tarsi reddish except at the tips; wings cinereous, brown on the fore part towards the tips and about the transverse veins, the brown part including a curved cinereous streak between the cubital and præbrachial veins; veins black; præbrachial vein very slightly undulating; discal transverse vein curved outward, parted by one-fourth of its length from the border, and by much more than its length from the oblique præbrachial transverse; halteres whitish yellow. Length of the body 7 lines; of the wings 12 lines.

The genus *Dacus* includes many distinct forms, and will probably be soon divided into numerous subgenera; the characters of the preceding species differ much from those of the type, *D. Oleæ*. Some of the following species may belong to *Senopterina*, Macq.

177. DACUS ADDENS, n. s. *Fem.* Cyaneus, longus, angustus, capite nigro, facie plana perobliqua, arista cinerea nuda, thorace vittis tribus cinereis, abdomine æneo-viridi, tibiis tarsis halteribusque nigris, alis cinereis apud costam et apud venam transversam discalem nigricantibus.

Female. Blue, long, narrow; head black, depressed above, white about the eyes; face very oblique, forming before the front a protuberance on which the antennæ are seated, its fore part oblong quadrate, almost flat, with whitish furrows for the antennæ; palpi and antennæ black, the latter reaching the epistoma; 3rd joint linear, rather obtuse at the tip, six times the length of the 2nd; arista cinereous, bare, hardly longer than the 3rd joint; thorax with three indistinct cinereous stripes; abdomen æneous-green, nearly linear, slightly compressed, much longer than the thorax; oviduct protuberant, slender; legs short, stout; tibiæ and tarsi black; wings grey, blackish along the costa and about the transverse veins; veins and halteres black; discal transverse vein straight, upright, parted by full one-fourth of its length from the border, and by much more than its length from the præbrachial transverse. Length of the body 6 lines; of the wings 12 lines.

178. *DACUS BILINEATUS*, n. s. *Fæm.* Fulvus, longiusculus, nigro bivittatus, capite antennisque rufescentibus, arista plumosa, palpis porrectis; pedibus breviusculis nigro fasciatis, alis cinereis, costa venaque transversa discali fusco nebulosis, halteribus testaceis.

Female. Tawny, rather long; head reddish in front; epistoma rather prominent; palpi porrect; antennæ reddish, nearly reaching the epistoma; 3rd joint linear, rounded at the tip, about thrice the length of the 2nd; arista somewhat plumose; thorax elongate-elliptical, with two black stripes; abdomen lanceolate, shining, with two broad black stripes, longer than the thorax; legs rather short, with diffuse black bands; wings grey, brownish along the costa and about the discal transverse vein; veins black, tawny at the base; discal transverse vein nearly straight and upright, parted by one-fourth of its length from the border, and by much more than its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

179. *DACUS IMITANS*, n. s. *Fæm.* Cyaneus, angustus, capite atro, antennis pedibusque nigris, tarsis posticis basi albidis, alis cinereis, costa vittaque nigris, halteribus piceis.

This species is closely allied to *D. longivitta*, and *D. exigens* and *D. contrahens* belong to the same group,

Female. Dark blue, narrow, with slight cinereous tomentum; head deep black above, white about the eyes; peristoma very prominent; proboscis large; antennæ black, nearly reaching the epistoma; 3rd joint linear, conical at the tip, about four times the length of the 2nd; arista bare, slender; abdomen fusiform, narrower and a little longer than the thorax; oviduct protuberant, slender; legs black, moderately long; first joint of the hind tarsi whitish above; wings cinereous, black along most of the costa to the tips, and black on the space between the cubital and præbrachial veins as far as the præbrachial transverse vein; discal transverse vein straight, upright, parted by

less than half its length from the border, and by very much more than its length from the præbrachial transverse; halteres piceous. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

180. *DACUS EXIGENS*, n. s. *Mas.* Viridescens cyaneus, angustus, capite rufescente piceo, antennis luteis, arista nuda, thorace vittis tribus cinereis, pedibus fulvis, alis cinereis striga costali apiceque fuscis, halteribus testaceis.

Male. Greenish blue, narrow; head reddish, piceous above, white about the eyes, black in front; antennæ luteous, reaching the epistoma; 3rd joint slightly lanceolate, full four times the length of the 2nd; arista slender, simple; thorax with three cinereous stripes; abdomen almost cylindrical, much longer than the thorax; legs tawny; tarsi black towards the tips; wings grey, brown at the tips and with a brown streak on the middle of the costa; veins black, tawny towards the base; discal transverse vein straight, upright, clouded with brown, parted by less than half its length from the border, and by much more than its length from the præbrachial transverse; halteres testaceous. Length of the body $3\frac{1}{4}$ lines; of the wings $5\frac{1}{2}$ lines.

181. *DACUS CONTRAHENS*, n. s. *Fæm.* Cyaneus, angustus, capite supra atro apud oculos albo, antennis luteis, thorace vittis tribus cinereis, pedibus piceis, alis cinereis vitta costali interrupta nigricante, vena transversa discali nigricante nebulosa, halteribus albidis.

Female. Dark blue, narrow; head deep black above, white about the eyes, piceous in front; antennæ luteous, reaching the epistoma; 3rd joint linear, conical at the tip, about six times the length of the 2nd; arista slender, simple; thorax with three cinereous stripes; abdomen compressed, a little longer than the thorax; legs piceous; wings grey, with a blackish interrupted costal stripe, which is dilated at the tip of the wing; veins black; discal transverse vein clouded with blackish, parted by half its length from the border, and by a little more than its length from the præbrachial transverse; halteres whitish. Length of the body 3 lines; of the wings 5 lines.

182. *DACUS INAPTUS*, n. s. *Mas et Fæm.* Viridis, capite atro, facie fulva basi alba, antennis piceis, pedibus halteribusque nigris, alis angustis cinereis.

Male and Female. Green, with slight cinereous tomentum; head deep black, white about the eyes; face tawny, white at the base; antennæ piceous, reaching the epistoma; 3rd joint lanceolate, full four times the length of the 2nd; arista bare, long, slender; thorax long, slightly compressed; abdomen slightly compressed at the base, linear, narrower and a little shorter than the thorax in the male, fusiform and much attenuated towards the tip in the female; legs black, moderately long; wings narrow, cinereous; veins black, straight; discal transverse vein straight, upright, parted by less than half its length from the border, and by almost twice its length from the præbrachial trans-

verse; halteres black. Length of the body $3\frac{1}{2}$ – $4\frac{1}{2}$ lines; of the wings 6–8 lines.

183. *DACUS TERMINIFER*, n. s. *Fam.* *Niger*, *nitens*, *breviusculus*, *capite rufescente*, *antennis fulvis*, *arista nuda*, *scutello pectorisque maculis duabus flavis*, *pedibus breviusculis*, *tibiis anterioribus femoribus posticis basi tarsisque albidis*, *alis vitreis*, *striga costali puncto apicali vittaque postica nigricantibus*, *halteribus testaceis*.

Female. Black, shining, rather short; head reddish above; antennæ tawny, reaching the epistoma; 3rd joint linear, piceous towards the tip, which is rounded, about six times the length of the 2nd; arista slender, bare; scutellum dull yellow; pectus with an oblique yellow spot on each side; abdomen hardly broader than long, a little broader and shorter than the thorax; legs rather short; tarsi and anterior tibiæ whitish; hind femora whitish towards the base; wings vitreous, with a short black stripe extending from the base to near the hind border; costa with a blackish streak in the middle and with a blackish apical point; discal transverse vein straight, upright, parted by about one-third of its length from the border, and by more than its length from the præbrachial transverse, which is oblique and unusually long; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

184. *DACUS EMITTENS*, n. s. *Mas et Fam.* *Fulvus*, *facie brevi nigro biguttata*, *antennis pallide luteis*, *arista nuda*, *thorace lineis quinque rufescentibus*, *disco nonnunquam nigricante-cinereo*, *scutello callisque humeralibus flavis*, *abdomine nigro-fasciato*, *alis vitreis fusco plus minusve strigatis*, *halteribus albedo-testaceis*.

Male and Female. Tawny, convex, minutely pubescent; face short, with a black dot on each side; antennæ pale luteous, reaching the epistoma; 3rd joint linear, conical at the tip, full four times the length of the 2nd; arista slender, bare, much longer than the 3rd joint; thorax with five reddish lines; scutellum and humeral calli yellow; metathorax with a blackish mark on each side; abdomen short, oval, broader than the thorax, concave beneath, from whence in the female the lanceolate apical part proceeds; a protuberance on each side at the base, and a black middle band, behind which there is a slight longitudinal black line; wings vitreous, lurid and partly brown along the costa, brown along the subanal vein, and brown about the tips, excepting most of the space between the discal transverse vein and the border; veins tawny, partly black, slightly deviating; discal transverse vein nearly straight, parted by about one-third of its length from the border, and by more than its length from the oblique and rather long præbrachial transverse; halteres whitish testaceous. *Var. β.* Abdomen with two black bands. *Var. γ, Male.* Discal transverse vein not clouded with brown. *Var. δ, Male.* Præbrachial transverse vein clouded with brown. *Var. ε, Male.* Disk of the thorax blackish grey; wings vitreous, excepting a slight brown line along the costa,

and another along the subanal vein. *Var. ζ, Male.* Abdomen with a black interrupted subapical band. Length of the body 3–6 lines; of the wings 5–10 lines.

This species is closely allied to *D. ferrugineus* and to *D. trivittatus*, but may be distinguished by the luteous hue along the costa.

185. *DACUS DIFFUSUS*, n. s. *Fem.* Testaceus, facie nigro fasciata, palpis nigro notatis, thoracis vittis duabus angustis abbreviatis et metathoracis fasciis duabus angustis nigris, abdomine fusiformi, alis subcinereis apud venas fuscescente subnebulosis.

Female. Testaceous, not shining; head paler about the eyes, with a black band on the face near the epistoma; palpi with a black mark on each outer side; antennæ reaching the epistoma; 3rd joint linear, rounded at the tip, more than four times the length of the 2nd; arista bare; thorax with two narrow abbreviated black stripes; metathorax with two slender black bands; abdomen fusiform, narrower and a little longer than the thorax; legs moderately long; wings slightly greyish, irregularly clouded with very pale brown about the veins; the latter black, testaceous towards the base; discal transverse vein straight, upright, parted by about one-fourth of its length from the border, and by much less than its length from the præbrachial transverse, which is undulating and very oblique. Length of the body 4 lines; of the wings 7 lines.

186. *DACUS FULVITARSIS*, n. s. *Fem.* Niger, longiusculus, capite apud oculos albo, antennis piceis, abdomine lanceolato, femoribus basi fulvis, metatarsis subdilatis, tarsis posterioribus fulvis, alis cinereis nigricante nebulosis, halteribus testaceis.

Female. Black, rather long and narrow; head white about the eyes; face small; antennæ piceous, short; 3rd joint nearly round, a little longer than broad; arista long, bare; thorax elongate; abdomen lanceolate, longer than the thorax; femora tawny at the base; metatarsi slightly dilated; posterior tarsi tawny, with black tips; wings grey, partly clouded with blackish; veins black; discal transverse vein straight, upright, parted by about twice its length from the border, and by about thrice its length from the præbrachial transverse; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. CALLANTRA, n. g.

Fem. Corpus convexum. Caput thorace vix angustius. *Palpi* distincti, porrecti. *Antennæ* longæ, petiolo aut articulo 1° communi, arista nuda. *Thorax* brevis. *Abdomen* petiolatum, postice ovatum et valde convexum, subtus concavum. *Pedes* mediocres. *Alæ* sat angustæ.

Female. Body convex. Head almost as broad as the thorax; face vertical; palpi distinct, porrect; antennæ long, seated on a common petiole or first joint, with which the succeeding part forms a right angle; 3rd joint very slightly increasing in breadth from the base to

the tip, full thrice the length of the 2nd joint, which is rather long; arista bare, slender, a little longer than the 3rd joint. Thorax short. Abdomen petiolated, oval and very convex hindward, concave beneath, very much longer than the thorax. Legs moderately long. Wings rather narrow.

187. *CALLANTRA SMIEROIDES*, n. s. *Fæm.* Fulva, facie nigro-biguttata, antennis testaceis, thoracis fascia, scutello, callis duobus humeralibus, pectoris lituris duabus, abdominis fasciis duabus lituraque subapicali flavis, alis subcinereis apud costam fusciscentibus, halteribus testaceis.

Female. Tawny; head testaceous about the eyes; face with a black dot on each side; antennæ testaceous, extending beyond the epistoma; thorax with two yellow humeral calli, and with a yellow band which is continued on each side of the pectus, the latter having a yellow mark on each side hindward; scutellum yellow; abdomen with the hind borders of the 1st and 2nd segments yellow; a yellow capitate subapical mark, which is dilated on each side; wings slightly grey, brownish along the costa; veins black, tawny towards the base; a lurid tinge along the subanal vein; discal transverse vein oblique, nearly straight, parted by less than half its length from the border, and by more than its length from the præbrachial transverse; halteres testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings $7\frac{1}{2}$ lines.

Gen. ARAGARA, n. g.

Fæm. Corpus angustum. Caput supra planum, thorace latius; facies valde retracta. Antennæ brevissimæ; articulus 3^{us} subrotundus; arista nuda. Thorax longus, subcompressus. Abdomen ovatum, thorace brevius. Pedes antici raptorii, coxis longissimis, femoribus incrassatis. Alæ sat angustæ.

Allied to *Dacus*.

Female. Body narrow. Head flat above, broader than the thorax; face much retracted. Antennæ very short; 3rd joint nearly round, a little longer than the 2nd; arista bare, slender. Thorax long, slightly compressed. Abdomen oval, shorter but hardly broader than the thorax. Fore legs raptorious; coxæ very long; femora incrassated; tibiæ shorter than the femora to which they are applied. Posterior legs moderately long and stout. Wings rather narrow.

188. *ARAGARA CRASSIPES*, n. s. *Fæm.* Cinereo-nigra, capite cyaneo, tarsis testaceis, alis cinereis, halteribus albis.

Female. Black, slightly covered with cinereous tomentum; head blue, shining, luteous on each side in front; antennæ black; thorax cinereous on each side; tarsi testaceous, with black tips; wings grey; veins black; præbrachial vein and subanal vein very near each other from the base to the discal transverse vein, which is straight and parted

by four times its length from the border, and by more than four times its length from the præbrachial transverse; halteres white. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. ENICOPTERA, *Macq.*

189. ENICOPTERA PICTIPENNIS, n. s. *Mas.* Fulva, longa, nitens, pubescens, capite luteo vitta lata, litura antica arcuata maculisque duabus lateralibus nigris, palpis nigro notatis, antennis basi nigro guttatis apice nigricantibus, abdomine longi-fusiformi nigricante basi fulvo, alis longis luteis apud costam nigris postice cinereis, vittis quatuor deviis fuscis.

Male. Tawny, long, shining, pubescent, testaceous beneath; head pale luteous, with a broad black stripe, which is dilated on each side; a black U-shaped mark about the face, which is black; a large black spot on each side of the peristoma; palpi partly black; antennæ blackish at the tips, and with a black dot on each at the base; 3rd joint linear, rounded at the tip, more than twice the length of the 2nd; arista plumose; pectus with a minute blackish mark on each side in front; abdomen blackish, except towards the base, elongate-fusiform, much longer and narrower than the thorax; legs long, testaceous, minutely pubescent; wings long, luteous, cinereous along the inner part of the hind border; black along the exterior part of the costa, and with four irregular brown stripes which are abbreviated towards the base, the first also interrupted; veins luteous, black in the dark parts; radial vein undulating; cubital vein hardly undulating; præbrachial vein curved and inclined forward towards its tip; discal transverse vein very oblique, slightly curved outwards, parted by less than half its length from the border, and by more than its length from the præbrachial transverse. Length of the body 7 lines; of the wings 16 lines.

190. ENICOPTERA TORTUOSA, n. s. *Mas.* Fulva, longa, nitens, pubescens, facie argenteo bistrigata, thoracis vittis duabus fasciaeque metathorace pectorisque disco nigris, abdomine lineari vittis duabus ventralibus nigris, alis longis vitreis subdilatis, vitta costali fulva nigricante nebulosa, apice furcata, vittis duabus obliquis flavo-fuscis.

Male. Tawny, long, shining, minutely pubescent; head depressed above, with a silvery streak on each side of the face; antennæ reaching the epistoma; 3rd joint linear, slightly and obliquely truncated at the tip, full four times the length of the 2nd; arista plumose; thorax with an irregular black stripe along each side, and with a black band adjoining the scutellum; metathorax and disc of the pectus black; abdomen linear, much longer and narrower than the thorax, with a black stripe beneath; legs long, minutely pubescent; wings long, vitreous, somewhat dilated, tawny and partly shaded with blackish along the costa; this costal stripe dilated towards the base, and emitting a fork towards the tip; two oblique brown and yellow stripes,

which part from the hind border, are united on the præbrachial transverse vein, and there join the costal stripe, the exterior one very short; veins black; radial vein excessively contorted towards its tip; cubital vein straight till near its tip, where it is inclined hindward, and is slightly undulating; præbrachial vein very undulating exteriorly; subanal vein straight; discal transverse vein very oblique, nearly straight, parted by full one-fourth of its length from the border, and by full half its length from the præbrachial transverse, which is straight, upright, and unusually long. Length of the body 7 lines; of the wings 16 lines,

Enicoptera flava, Macq. (Dipt. Exot. Suppl. 3, 63), the type of this genus, inhabits Java, and is closely allied to *E. tortuosa*, and may be a local variety of the latter species, but differs from the character and figure. Macquart states that his description was taken from an apparently immature specimen.

191. ENICOPTERA ARCUOSA, n. s. *Mas.* Fulva, longa, nitens, pubescens, capite pallide luteo vitta lata biramosa fasciaque antica nigris, thoracis lineolis duabus maculisque duabus anterioribus pectorisque lituris duabus nigris, abdomine fusiformi, alis longis lutescentibus sat angustis apices versus fuscis postice cinereis, vitta discali albida, fascia exteriore alba antice furcata et arcuata.

Male. Tawny, long, shining, minutely pubescent; head pale luteous, with a broad black stripe which emits an oblique branch on each side to the eye, and with a black band by the epistoma; antennæ nearly reaching the epistoma; 3rd joint linear, rounded at the tip, thrice the length of the 2nd; arista plumose; thorax with two short black lines, each with a black spot in front; pectus with a black mark on each side; abdomen fusiform, longer but hardly narrower than the thorax; legs long, hardly pubescent; wings long, rather narrow, somewhat luteous, brown towards the tips, grey along the hind border, with a short whitish discal stripe which terminates in a white band, the latter abbreviated hindward and forked in front, the exterior fork much curved and terminating behind the tip of the wing; veins tawny, black towards the tips; radial vein slightly undulating opposite the præbrachial transverse vein; the other veins straight; discal transverse vein slightly oblique, slightly curved outward, parted by full one-third of its length from the border, and by nearly twice its length from the præbrachial transverse; halteres testaceous. Length of the body 6 lines; of the wings 14 lines.

192. ENICOPTERA? PLAGIFERA, n. s. *Fæm.* Testacea, longiuscula, frontis puncto nigro, facie nigricante-cinerea, palpis nigro guttatis, antennis luteis, thoracis lineis tribus strigisque duabus exterioribus, metathorace pectorisque lituris nigris, abdomine fusiformi fasciis duabus basalibus nigris; alis vitreis longiusculis, strigis duabus basalibus fasciis duabus plagaque subapicali fuscis.

Female. Testaceous, rather long, not shining, with a few black bristles;

head a little narrower than the thorax, with a black point on the front; face blackish grey; palpi with a black dot on each outer side; antennæ pale luteous, not reaching the epistoma; 3rd joint linear, rounded at the tip, about four times the length of the 2nd; arista bare; thorax with three black lines and with two short and more exterior black streaks; metathorax black, shining; pectus with some black marks on each side; abdomen fusiform, hardly longer than the thorax, with two black bands near the base; legs moderately long; wings vitreous, rather long, with two narrow brown bands, the interior band emitting two brown streaks to the base of the wing, the exterior band curved, continued along the costa to the tip of the radial vein, the space beyond it mostly occupied by an elliptical brown patch; veins black, straight; discal transverse vein straight, upright, parted by more than half its length from the border, and by nearly twice its length from the oblique præbrachial transverse. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

Gen. ORTALIS, *Fallen.*

The two following species belong to a new group of *Ortalis*, and will probably form a distinct genus.

193. ORTALIS DECATOMOIDES, n. s. *Mas.* Obscure rufa, thorace brevi, abdomine nigro, fusiformi, basi rufo, pedibus fulvis, femoribus posterioribus basi albidis, tibiis posticis nigris, alis subcinereis, macula apicali fascisque duabus nigricantibus.

Male. Dull red; head rather large, a little broader than the thorax, blackish on each side of the face; antennæ wanting; thorax short; abdomen black, shining, fusiform, red at the base, a little narrower but hardly longer than the thorax; legs tawny; posterior femora whitish at the base; hind tibiæ black; wings slightly greyish, rather convex along the hind border, blackish at the tips, and with two blackish bands; first band rather oblique; veins black; præbrachial vein and cubital vein slightly curved and approximating towards the tip of the wing; discal transverse vein straight, upright, short, parted by much more than its length from the border, and by full twice its length from the præbrachial transverse, which is extremely short; Length of the body $1\frac{1}{4}$ line; of the wings $2\frac{1}{2}$ lines.

194. ORTALIS VACILLANS, n. s. *Fæm.* Fulva, arista pubescente, abdomine nigro postice lanceolato, alis limpidis, costa striga basali fascisque tribus nigricantibus.

Closely allied to *D. decatomoides*. *Female.* Tawny, shining; head full as broad as the thorax; epistoma slightly prominent; antennæ nearly reaching the epistoma; 3rd joint linear, conical towards the tip, about four times the length of the 2nd; arista pubescent; abdomen black, a little longer than the thorax, lanceolate hindward; wings limpid, blackish along the costa, with a blackish streak, and with three slen-

der blackish bands; 1st band short, oblique, abbreviated hindward by the end of the basal streak; 2nd curved, slightly abbreviated hindward; 3rd nearly straight, entire; discal transverse vein upright, nearly straight, parted by less than half its length from the border, and by much more than its length from the præbrachial transverse. Length of the body 2 lines; of the wings 4 lines.

Gen. TRYPETA, *Meigen*.

195. TRYPETA BASIFASCIA. *Fæm.* Ferruginea, longiuscula, capite antennisque luteis, arista plumosa, metathorace nigro, pectoris disco nigricante, abdomine nigro basi fulvo, pedibus halteribusque fulvis, femoribus posterioribus nigricantibus, alis nigris albo notatis basi vitreis.

Female. Ferruginous, shining, rather long; head luteous, white about the eyes, narrower than the thorax; face rather long; sides of the peristoma slightly dilated; antennæ luteous, very short, not extending to half the length of the face; 3rd joint conical, much longer than the 2nd; arista plumose; metathorax black; disk of the pectus blackish; abdomen black, fusiform, tawny towards the base, a little longer than the thorax; legs and halteres tawny; posterior femora blackish; wings black, mostly vitreous towards the base, with two white spots on the costa, with two on the hind border, and with four or five transverse white dots on the disk; veins black, tawny at the base; discal transverse vein straight, upright, parted by much less than its length from the border, and by much more than its length from the præbrachial transverse. Length of the body 4 lines; of the wings 7 lines.

196. TRYPETA NIGRIFASCIA, n. s. *Mas.* Fulva, capite antennisque pallide luteis, arista plumosa, thoracis lineis duabus et fascia metathoraceque nigris, abdomine elliptico, alis vitreis latiusculis, vitta costali fulva vittaque postica fusca.

Male. Tawny, shining; head pale luteous, whitish on the face and about the eyes; antennæ pale luteous, not near reaching the epistoma; 3rd joint elongate-conical, about twice the length of the 2nd; arista plumose; thorax with an irregular black line on each side, and with a black band in front of the scutellum; metathorax black; abdomen elliptical, much shorter and a little narrower than the thorax; wings vitreous, rather broad, with a broad tawny stripe, which occupies the whole base and extends beyond the tip along the costa, where it contains some grey marks; a brown stripe near the hind border, abruptly angular exteriorly; veins tawny; discal transverse nearly straight and upright, parted by less than half its length from the border, and by more than its length from the præbrachial transverse. Length of the body 3 lines; of the wings 6 lines.

197. TRYPETA LATIVENTRIS, n. s. *Mas.* Fusca, lata, depressa, capite, antennis, scutello abdomineque rufescentibus, arista subpubes-

cente, abdomine vitta interrupta nigra, pedibus testaceis, femoribus nigricantibus postice cinereis, lituris costalibus et marginalibus vitreis.

Male. Brown, rather broad and flat; head reddish, a little narrower than the thorax, testaceous on the face and about the eyes; face quite flat; antennæ reddish, not near reaching the epistoma; 3rd joint linear, rounded at the tip, more than twice the length of the 2nd; arista minutely pubescent; thorax with black bristles on each side; scutellum and abdomen dark reddish, the latter broader and not longer than the thorax, with a black stripe which is interrupted on the hind border of each segment; legs testaceous; femora blackish, testaceous towards the tips; wings blackish, rather broad, cinereous along the basal part of the hind border, with two small vitreous marks towards the tip of the costa, and with three vitreous marks hindward, the middle one much larger than the other two; veins black; discal transverse vein nearly straight and upright, parted by a little less than half its length from the border, and by a little less than its length from the præbrachial transverse; alulæ and halteres testaceous. Length of the body $3\frac{1}{2}$ lines; of the wings 5 lines.

198. *TRYPETA STELLIPENNIS*, n. s. *Mas et Fæm.* Ferruginea, capite antennisque pallide luteis, arista plumosa, metathorace nigricante, abdomine fusiformi, pedibus halteribusque testaceis, alis nigricantibus latiusculis, guttis marginalibus punctisque discalibus albis.

Male and Female. Ferruginous, paler beneath; head pale luteous, not so broad as the thorax; epistoma not prominent; antennæ pale luteous, not near reaching the epistoma; 3rd joint linear, rounded at the tip, full twice the length of the 2nd; arista plumose; metathorax blackish; abdomen fusiform, narrower and a little longer than the thorax; oviduct of the female cylindric-lanceolate; legs and halteres testaceous; wings blackish, rather broad, white at the tips, with white marginal dots and with white discal points; veins black; discal transverse vein upright, nearly straight, parted by a little more than one-fourth of its length from the border, and by about its length from the præbrachial transverse, which is rather long. Length of the body $2\frac{1}{2}$ - $3\frac{1}{2}$ lines; of the wings 5-6 lines.

199. *TRYPETA AMPLIFENNIS*, n. s. *Fæm.* Cinerea, capite antennis pedibus halteribusque fulvis, arista nuda, abdomine nigro fusiformi basi fulvo apicem versus lanceolato, alis nigris latissimis albo guttatis.

Female. Cinereous, dull; head tawny, whitish about the eyes; face flat; antennæ tawny, very short, not extending beyond half the length of the face; 3rd joint conical, a little longer than the 2nd; arista bare; abdomen fusiform, black, shining, tawny towards the base, lanceolate towards the tip, a little narrower and much longer than the thorax; legs and halteres tawny; wings black, very broad, with a white apical spot, with some white marginal and discal dots, and with two larger white transverse costal marks; veins black, tawny at the

base ; discal transverse vein straight, upright, parted by about half its length from the border, and by a little less than its length from the præbrachial transverse. Length of the body 3 lines ; of the wings 6 lines.

200. *TRYPETA APPROXIMANS*, n. s. *Fæm.* Nigra, nitens, capite rufescente, facie cinerea, abdomine elliptico apicem versus lanceolato, pedibus fulvis, femoribus nigris, alis nigricantibus albo maculatis.

Female. Black, shining ; head reddish ; face cinereous ; abdomen elliptical, lanceolate towards the tip, much longer than the thorax ; legs tawny ; femora black ; wings blackish, with two white triangular spots on the costa, with three white dots on the disk, with three white streaks on the hind border, and with two white subapical streaks ; veins black ; discal transverse vein nearly straight and upright, parted by much less than its length from the border, and by a little less than its length from the præbrachial transverse. Length of the body $1\frac{1}{4}$ line ; of the wings $2\frac{1}{2}$ lines.

Gen. *SOPHIRA*, *Walk.*

201. *SOPHIRA BISTRIGA*, n. s. *Fæm.* Fulva, capite luteo, arista plumosa, thorace pectoreque nigro maculatis, metathorace vittis duabus nigris, abdomine fusiformi maculis lateralibus nigris, oviductu lanceolato, alis nigricantibus albo bifasciatis basi fulvis.

Female. Tawny, shining ; head luteous, hardly as broad as the thorax, white about the eyes ; antennæ tawny, not near reaching the epistoma ; 3rd joint elongate-conical, more than twice the length of the 2nd ; arista plumose ; thorax with four large black spots ; metathorax with two black stripes ; pectus with two elongated black spots on each side ; abdomen fusiform, with a long lanceolate flat oviduct, much longer than the thorax ; each segment with two large lateral black spots ; wings blackish, tawny towards the base, with two white bands, the exterior band curved outward in front, and not extending to the costa ; veins black, tawny towards the base ; discal transverse vein curved outward, parted by full one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse. Length of the body $4\frac{1}{2}$ lines ; of the wings 8 lines.

Gen. *PALLOPTERA*, *Fallen.*

202. *PALLOPTERA DETRACTA*, n. s. *Mas.* Testacea, capite apud oculos cinereo, arista subpubescente, abdomine guttis duabus lateralibus subapicalibus nigris, alis cinereis.

Male. Testaceous ; head pale cinereous behind and about the eyes ; antennæ short, tawny ; arista very minutely pubescent ; abdomen oval, not longer than the thorax, with a black dot on each side of the subapical segment ; wings grey ; veins black, testaceous at the base ;

discal transverse vein straight, upright, parted by hardly half its length from the præbrachial transverse. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Subfam. DIOPSIDES, *Walk.*

Gen. DIOPSIS, *Linn.*

203. *Diopsis subnotata*, *Westw. Orient. Ent.* pl. 18. f. 2.

Inhabits also the Philippine Islands.

204. *DIOPSIS DETRAHENS*, n. s. *Fæm.* Nigra, capite ex parte ferrugineo, oculorum petiolis breviusculis, abdomine subtus lurido, coxis femoribusque fulvis, his apice nigris, alis nigricantibus macula subcostali alba.

Female. Black; head partly ferruginous; petioles of the eyes each equal in length to the space between them; abdomen lurid beneath; coxæ and femora tawny, the latter with black tips; wings blackish, with a white subcostal spot towards the tip; veins black; halteres piceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Subfam. SEPSIDES, *Walk.*

Gen. CALOBATA, *Fabr.*

205. *CALOBATA RESOLUTA*, n. s. *Mas.* Nigra, abdomine lineari longo, segmentis albido marginatis, pedibus longissimis, femoribus posterioribus testaceo trifasciatis, femoribus anticis basi coxisque anticis testaceis, tarsis anticis albis, alis cinereis apices versus obscurioribus fascia subapicali albida.

Male. Black, slightly shining; pectus with an oblique cinereous band on each side; abdomen linear, pale beneath, much narrower than the thorax, and nearly twice its length, hind borders of the segments whitish; legs black, very long; posterior femora with three testaceous bands; fore femora at the base, and fore coxæ, testaceous; fore tarsi white; wings dark grey, blackish grey on each side of a whitish subapical band; veins black: discal transverse vein straight, upright, parted by about half its length from the border, and by more than four times its length from the præbrachial transverse; halteres piceous. Length of the body 6 lines; of the wings 10 lines.

206. *CALOBATA IMPINGENS*, n. s. *Mas et Fæm.* Obscure cyanea, antennis rufis, abdomine subtus ferrugineo segmentis albo marginatis, pedibus fulvis, femoribus tibiisque anticis nigris, illis basi fulvis, femoribus posterioribus nigro trifasciatis, tibiis tarsisque posterioribus obscure fulvis, tarsis anticis albis basi nigris, alis cinereis fusco bifasciatis.

Male and Female. Dark blue; head white about the eyes; antennæ red; abdomen lanceolate, ferruginous beneath, narrower and very

much longer than the thorax, hind borders of the segments white; legs tawny, very long; posterior coxæ and fore tibiæ black; posterior femora with three black bands; fore femora black, tawny towards the base; posterior tibiæ and posterior tarsi dark tawny; fore tarsi white, black at the base; wings grey, with two brown bands, the second apical; veins black; cubital vein and præbrachial vein converging to the tip of the wing; discal transverse vein straight, upright, parted by much less than its length from the border, and by more than thrice its length from the præbrachial transverse. *Var. β*: Bands of the wings broader and more complete. Length of the body 4-5 lines; of the wings 7-8 lines.

This species is erroneously recorded as *C. indica* in Vol. III. p. 124.

207. *CALOBATA BIFASCIATA*, n. s. *Fæm.* Nigra, longissima, gracillima, capite litura transversa albida, arista breviuscula basi robusta, abdominis dimidio antico subclavato fasciis duabus cinereis, dimidio postico lanceolato, femoribus posticis basi albidis apice rufescentibus, tarsis anticis albis apice nigris, alis cinereis nigricante bifasciatis.

Female. Black, very long and slender; head with a whitish transverse mark in front of the face, which is very short; 3rd joint of the antennæ elongate-conical, more than twice the length of the 2nd; arista rather short, stout towards the base; thorax attenuated in front; abdomen more than twice the length of the thorax, broadest in the middle, subclavate to half its length, lanceolate from thence to the tip, two cinereous bands on the basal half; legs long; hind femora whitish at the base, reddish at the tips; fore tarsi white, with black tips; wings grey, slightly blackish at the tips, and with two blackish bands, the second broader and more complete than the first; veins black; cubital vein and præbrachial vein slightly converging towards the tip of the wing; discal transverse vein straight, oblique, parted by less than its length from the border, and by more than thrice its length from the præbrachial transverse. Length of the body 5 lines; of the wings 8 lines.

Gen. *CARDIACEPHALA*, *Macq.*

208. *CARDIACEPHALA VARIPES*, n. s. *Mas.* Testacea, gracillima, capite subelongato, antennis pallide rufis basi nigris, thorace antico attenuato, abdomine lineari apicem versus tumido, femoribus intermediis subincrassatis, tibiis intermediis nigris, tarsis intermediis albis apice nigris, alis pallide fusciscentibus, basi fasciæque cinerascensibus.

Male. Testaceous, very slender; head somewhat elongated; antennæ pale red, black at the base; thorax long, attenuated in front; abdomen linear, tumid towards the tip, narrower and much longer than the thorax; legs very long; fore legs much shorter and more slender than the others; middle femora slightly incrassated, except towards the tips; middle tibiæ black; middle tarsi white, with black tips; wings

pale brownish, greyish towards the base and with a greyish band beyond the discal transverse vein; veins black, testaceous towards the base; cubital vein and præbrachial vein slightly converging towards the tip of the wing; discal transverse vein straight, upright, parted by less than its length from the border, and by about thrice its length from the præbrachial transverse. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

Gen. SEPSIS, *Fallen.*

209. SEPSIS TESTACEA, n. s. *Mas et Fæm.* Testacea aut fulva, antennis pallide rufis, abdomine subpubescente, alis cinerascentibus, costa basali nigra. *Var. β.* Abdomine piceo basi fulvo.

Male and Female. Testaceous or tawny, slightly setose; antennæ pale red, 3rd joint conical, about twice the length of the 2nd; abdomen slightly pubescent; wings greyish, black along the costa towards the base; veins black; discal transverse vein straight, upright, parted by a little more than its length from the border, and by more than its length from the præbrachial transverse. *Var. β:* Abdomen piceous, tawny towards the base. Length of the body 2-3 lines; of the wings 3-4 lines.

210. SEPSIS FRONTALIS, n. s. *Mas.* Nigra, capite antico, antennis, pedibus anticis femoribusque posterioribus basi testaceis, alis vitreis. *Fæm.* Fulva, abdomine nigro.

Male. Black, shining; head in front and antennæ testaceous; fore legs testaceous; posterior femora testaceous towards the base; wings vitreous; veins black; discal transverse vein straight, oblique, parted by twice its length from the border, and from the præbrachial transverse. *Female.* Tawny; abdomen black. Length of the body 1 line; of the wings 2 lines.

211. SEPSIS FASCIPES, n. s. *Fæm.* Nigra, subnitens, antennis pallide rufis, abdomine fusiformi postice attenuato, pedibus albis, tibiis intermediis femoribusque nigris, tibiis posticis basi apiceque nigris, alis cinereis macula apicali nigra.

Female. Black, slightly shining; antennæ pale red, very short, 3rd joint conical; abdomen fusiform, lanceolate and much attenuated towards the tip, much longer than the thorax; legs white; femora and middle tibiæ black; hind tibiæ black at the base and at the tips; wings grey, with a black spot at the tip of the costa; veins black; discal transverse vein straight, upright, parted by its length from the border, and by full twice its length from the præbrachial transverse. Length of the body $\frac{3}{4}$ line; of the wings 3 lines.

212. SEPSIS REVOCANS, n. s. *Fæm.* Cupreo-nigra, antennis nigris, pedibus halteribusque testaceis, alis subcinerascentibus basi nigricantibus.

Female. Cupreous-black, shining; antennæ black, very short; legs

testaceous ; wings slightly greyish, blackish at the base of the costa ; veins black ; discal transverse vein straight, upright, parted by more than twice its length from the border, and by less than twice its length from the præbrachial transverse ; halteres testaceous. Length of the body $1\frac{1}{2}$ line ; of the wings 2 lines.

Subfam. PSILIDES, *Walk.*

Gen. MICROPEZA, *Macq.*

213. *Micropeza fragilis*, *Walk.* See Vol. I. p. 37.

Gen. CÆNURGIA, n. g.

Mas. *Corpus* gracile. *Caput* elongatum, antice conicum. *Antennæ* porrectæ ; articulus 3^{us} lanceolatus ; arista apicalis, sat robusta. *Thorax* linearis. *Abdomen* fusiforme, thorace vix angustius, non longius. *Pedes* longi ; femora lata, compressa ; tarsi antici articulo 1^o dilatato fusiformi. *Alæ* breviusculæ, sat angustæ.

Allied to *Nerius*. *Male*. Body slender. Head elongate, conical in front, as broad as the thorax. *Antennæ* porrect ; 1st and 2nd joints short ; 3rd lanceolate ; arista rather stout, apical, larger than all the preceding joints. *Thorax* linear. *Abdomen* fusiform, hardly narrower and not longer than the thorax. *Legs* long, femora broad, compressed ; fore tarsi with the first joint dilated, fusiform. *Wings* rather short and narrow.

214. CÆNURGIA REMIPES, n. s. *Mas.* Fulva, capite guttis tribus nigris, antennis basi nigris, arista alba, thorace maculis duabus nigris, pedibus nigris, coxis femoribusque luteis apice nigris, alis flavo-cinereis, halteribus apice nigris.

Male. Tawny ; head with a black spot on the vertex, and with two black dots on each side, one in front, the other behind ; antennæ black towards the base ; arista white ; thorax with a black spot on each side in front ; legs black ; coxæ and femora luteous, with black tips ; wings grey, tinged with yellow ; veins black ; cubital vein and præbrachial vein converging towards the tip of the wing ; discal transverse vein straight, oblique, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse ; halteres with black knobs. Length of the body $3\frac{1}{2}$ lines ; of the wings $5\frac{1}{2}$ lines.

Gen. NERIUS, *Wied.*

215. *Nerius fuscipennis*, *Macq.* See Vol. I. p. 38.

Gen. SERACA, n. g.

Fæm. *Corpus* longiusculum. *Caput* transversum, thorace vix angustius. *Antennæ* breves, articulo 3^o conico, arista plumosa. *Thorax* ellip-

ticus. *Abdomen* ellipticum. *Pedes* mediocres. *Alæ* longiusculæ, latiusculæ.

Female. Body rather long. Head transverse, nearly as broad as the thorax; epistoma not prominent. Antennæ short, not near reaching the epistoma; 3rd joint conical, much longer than the 2nd; arista plumose. Thorax and abdomen elliptical, about equal in length. Legs moderately long and slender. Wings rather long and broad.

216. *SERACA SIGNIFERA*, n. s. *Fem.* Fulva, thorace vittis quatuor metathorace vittis duabus abdomine maculis lateralibus nigris, alis obscure fuscis albo quinquesignatis apud costam nigricantibus basi flavis.

Female. Tawny, shining; head testaceous about the eyes; thorax with four black stripes, the outer pair incomplete; metathorax with two black stripes; abdomen with a row of black spots along each side; wings dark brown, blackish along the costa, yellow at the base, with five lanceolate white marks, two of these resting on the costa, the third between them near the hind border, the fourth exterior, discal, slender, oblique, the fifth on the hind border near the tip; veins black, tawny at the base; discal transverse vein curved outward, parted by about one-fourth of its length from the border, and by much more than its length from the præbrachial transverse. Length of the body 4 lines; of the wings 8 lines.

217. *SERACA SIGNATA*, n. s. *Fem.* Testacea, longiuscula, epistomate guttis duabus nigris, arista plumosa, abdomine postice attenuato maculis duabus lateralibus subapicalibus, alis cinerascens, costa exteriore nigricante.

Female. Testaceous, shining, rather long; head nearly as broad as the thorax, with a black dot on each side of the epistoma; antennæ short, 3rd joint elongate-conical, arista plumose; thorax elliptical; abdomen attenuated hindward, longer than the thorax, with a black spot on each side of the 5th segment; wings greyish, blackish along the apical half of the costa; veins testaceous, black towards the tips; discal transverse vein nearly straight and upright, parted by about one-fourth of its length from the border, and by hardly more than its length from the præbrachial transverse. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

Gen. *PSILA*, Meigen.

218. *PSILA BIPUNCTIFERA*, n. s. *Fem.* Testacea, facie nigro bipunctata, antennarum articulo 3^o longiconico, arista pubescente, abdomine guttis duabus apicalibus nigris, alis pallide cinereis flavo suffusis.

Female. Testaceous; head somewhat pilose beneath, with a black point on each side of the face; 3rd joint of the antennæ elongate-conical, about twice the length of the 2nd; arista pubescent; thorax elongate, somewhat flat above; abdomen fusiform, a little longer than the thorax;

5th segment with a black dot on each side; wings pale cinereous, tinged with yellow; veins yellow; discal transverse vein straight, oblique, parted by hardly more than one-fourth of its length from the border, and by more than its length from the præbrachial transverse. Length of the body 5 lines; of the wings 10 lines.

219. *PSILA MUNDA*, n. s. *Mas et Fœm.* Nigra, nitens, facie testacea nigro notata, antennis testaceis basi nigris, arista plumosa, thorace subcinerascente, scutello obscure testaceo, pedibus testaceis, alis cinereis apud costam nigricantibus, halteribus albidis.

Male and Female. Black, shining; head testaceous, blackish above; disk of the face black, shining; antennæ short, testaceous, black at the base; 3rd joint linear, rounded at the tip, about twice the length of the 2nd; arista plumose: thorax linear, with slight cinereous tomentum; scutellum dull testaceous; abdomen fusiform, a little longer than the thorax; legs testaceous; wings grey, blackish along the costa towards the tips; veins black; discal transverse vein straight, upright, parted by about half its length from the border, and by nearly thrice its length from the præbrachial transverse; halteres whitish. Length of the body $2\frac{1}{2}$ –3 lines; of the wings 4–5 lines.

Gen. *TEXARA*, Walk.

220. *TEXARA DIOCTRIOIDES*, n. s. *Mas et Fœm.* Nigra, longa, gracilis, capite nigro-cyaneo, thorace vittis quatuor cinereis, segmentorum abdominalium lateribus albo marginatis, pedibus fulvo fasciatis, alis cinereis, halteribus testaceis.

Male and Female. Black, long, slender; head bluish-black, white about the eyes in front; antennæ of the male piceous, of the female tawny, 3rd joint round, arista minutely pubescent; thorax with four cinereous stripes; abdomen about twice the length of the thorax, cylindrical towards the base, subclavate in the male and elongate-fusiform in the female hindward: hind borders of the segments white on each side; fore femora, hind tibiæ and hind tarsi tawny at the base; middle legs and hind femora tawny, the latter with a broad black band; fore tibiæ white, black at the base; wings grey; veins black; discal transverse vein straight, upright, parted by less than its length from the border, and by almost four times its length from the præbrachial transverse; halteres testaceous. Length of the body 4– $4\frac{1}{2}$ lines; of the wings 6–7 lines.

Gen. *GOBRYA*, n. g.

Mas. *Corpus* gracillimum. *Caput* thorace multo latius; frons sat angusta; facies plana. *Oculi* magni. *Antennæ* brevissimæ; articulus 3^{us} conicus; arista pubescens. *Thorax* sat parvus. *Abdomen* cylindricum, gracillimum, apice clavatum, thorace duplo longius. *Pedes* graciles; anteriores breves; postici longiusculi. *Alæ* perangustæ.

Male. Body very slender. Head much broader than the thorax; front rather narrow; face vertical, flat; eyes large, prominent. Antennæ very short; 3rd joint conical, longer than the 2nd; arista pubescent. Thorax rather small. Abdomen clavate, about twice the length of the thorax, cylindrical and very slender till near its tip. Legs slender; anterior legs short; hind legs rather long. Wings very narrow; discal transverse vein straight, upright, parted by more than its length from the border, and by more than four times its length from the præbrachial transverse.

221. *GOBRYA BACCHOIDES*, n. s. *Mas.* Cyanea, nitens, antennis pedibusque pallide flavis, abdomine nigro fasciis duabus flavis, femoribus posterioribus tibiisque posticis nigris, tarsis posticis basi nigris, alis vix cinerascens, halteribus flavis apice nigris.

Male. Blue, shining; proboscis, antennæ, and legs pale yellow; abdomen black, with two pale yellow bands, the hind one very slender; posterior femora and hind tibiæ black, the former pale yellow at both ends; middle tibiæ and tarsi wanting; hind tarsi black towards the base; wings hardly greyish, apical third part brown; veins black; halteres pale yellow, with black knobs. Length of the body $2\frac{3}{4}$ lines; of the wings 4 lines.

Subfam. OSCINIDES, *Haliday.*

Gen. OSCINIS, *Fabr.*

222. *OSCINIS FEMORATA*, n. s. *Mas.* Atra, nitens, capite nigro-cyaneo, femoribus anterioribus basi, tibiis anterioribus apice, tarsis halteribusque flavis, femoribus posticis incrassatis, alis cinerascens.

Male. Deep black, shining; head bluish-black; abdomen conical, shorter than the thorax; legs black; anterior femora at the base, anterior tibiæ at the tips, and tarsi yellow; hind femora incrassated; wings greyish; veins black; discal transverse vein straight, upright, parted by more than its length from the border, and by much more than its length from the præbrachial transverse; halteres yellow. Length of the body $1\frac{1}{4}$ line; of the wings 2 lines.

Gen. PIOPHILA, *Fallen.*

223. *PIOPHILA CONTECTA*, n. s. *Fæm.* Nigra, nitens, oviductu lanceolato, pedibus halteribusque fulvis, pedibus anticis nigris, femoribus basi fulvis, alis cinereis.

Female. Black, shining; oviduct prominent, lanceolate; legs and halteres tawny; fore legs black; coxæ, femora at the base and knees tawny; wings grey; veins black; discal transverse vein straight, upright, parted by less than its length from the border, and by more than its length from the præbrachial transverse. Length of the body 2 lines; of the wings 4 lines.

Gen. OPOMYZA, *Fallen.*

224. *OPOMYZA NIGRIFINIS*, n. s. *Fem.* Cinerea, capite antennisque pallide rufis, arista plumosa, thorace bilineato, pectore halteribusque albis, abdomine fulvo lanceolato apicem versus nigro, pedibus fulvis, alis nigris albo guttatis.

Female. Cinereous; head pale red, white beneath; antennæ pale red, very short, 3rd joint nearly round, arista plumose; thorax with two indistinct darker lines; pectus and halteres white; abdomen lanceolate, tawny, shining, black towards the tip; legs tawny; wings black, rather narrow, with about ten white dots, of which two are larger than the others, and form a broken and almost interrupted band near the base; veins black; discal transverse vein straight, upright, parted by about half its length from the border; no præbrachial transverse vein. Length of the body $1\frac{1}{4}$ – $1\frac{1}{2}$ lines; of the wings $2\frac{1}{2}$ –3 lines.

Gen. DROSOPHILA, *Fallen.*

225. *DROSOPHILA SOLENNIS*, n. s. *Mas.* Testacea, facie carinata, thorace vittis quatuor fulvis, abdomine fasciis abbreviatis nigricantibus, alis cinereis.

Male. Testaceous; face keeled; antennæ wanting; thorax with four tawny stripes; abdomen elliptical, a little longer than the thorax, with blackish abbreviated bands; wings grey; veins black; discal transverse vein straight, upright, parted by hardly less than its length from the border, and by about thrice its length from the præbrachial transverse. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

226. *DROSOPHILA RUDIS*, n. s. *Mas.* Fulva, facie albida, abdomine nigro nitente basi fulvo, pedibus halteribusque testaceis, alis cinereis apud costam obscurioribus maculis quatuor nigricantibus.

Male. Tawny, testaceous beneath; face whitish; antennæ wanting; abdomen elongate-oval, black, shining, tawny at the base, not longer than the thorax; legs and halteres testaceous; wings grey, darker along the costa, with four blackish spots, first spot subcostal, larger than the second which is discal, third apical, band between the second and third spots irregular, attenuated hindward; veins black; discal transverse vein straight, upright, parted by nearly its length from the border, and by nearly twice its length from the præbrachial transverse. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

227. *DROSOPHILA ILLATA*, n. s. *Fem.* Fulva, segmentorum abdominalium marginibus pedibusque testaceis, alis cinereis.

Female. Tawny; antennæ very short, 3rd joint conical, arista thinly plumose; abdomen oval, not longer than the thorax, hind borders of the segments and legs testaceous; wings grey; veins black, tawny at the base; discal transverse vein straight, upright, parted by about its length from the border, and by nearly four times its length from the præbrachial transverse. Length of the body $1\frac{1}{4}$ line; of the wings $2\frac{1}{2}$ lines.

228. *DROSOPHILA LURIDA*, n. s. *Mas.* Atra, capite piceo, arista plumosa, abdomine lurido subpubescente, pedibus obscure fulvis, alis lurido-cinereis, punctis marginalibus nigris, vena transversa præbrachiali nigro nebulosa.

Male. Deep black; head piceous; antennæ short, 3rd joint elongate-conical, arista thinly plumose; pectus piceous; abdomen oval, lurid red, minutely pubescent, not longer than the thorax; legs dull tawny; wings lurid grey, blackish at the base, with black points at the tips of the longitudinal veins; veins yellowish; discal transverse vein straight, upright, with a black point at each end, parted by less than its length from the border, and by about twice its length from the præbrachial transverse, which is clouded with black. Length of the body 2 lines; of the wings 4 lines.

229. *DROSOPHILA LATERALIS*, n. s. *Mas.* Fulva, subtus testacea, abdomine maculis lateralibus nigris, pedibus halteribusque testaceis, alis cinereis.

Male. Tawny, testaceous beneath; antennæ short, 3rd joint conical, arista plumose; abdomen not longer than the thorax, with black spots along each side; legs and halteres testaceous; wings grey; veins black. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Gen. DISCOMYZA, *Meigen*.

230. *DISCOMYZA OBSCURATA*, n. s. *Fæm.* Cinereo-nigra, capite abdomineque nigris nitentibus, antennis obscure rufis, arista plumosa, pectoris lateribus albido conspersis, alis cinereis fascia informi maculaque apicali nigricantibus, halteribus albis.

Female. Cinereous black; head black, shining; antennæ short, dark red, 3rd joint conical, longer than the 2nd, arista thinly plumose; sides of the pectus with minute whitish speckles; abdomen elliptical, flat, black, shining, longer than the thorax; legs black; wings grey, with an irregular blackish band which does not extend to the hind border, and with a blackish apical spot; veins black; discal transverse vein straight, oblique, parted by much less than its length from the border, and by very much more than its length from the præbrachial transverse, which is clouded with black; halteres white. Length of the body 2 lines; of the wings 3 lines.

Gen. NOMBA, n. g.

Mas et Fæm. Corpus latum, crassum. *Frons* lata. *Antennæ* brevissimæ; articulus 3^{us} subrotundus; arista subpubescens. *Thorax* subpubescens, quasi coriaceus; scutellum parvum; metathorax maximus, abdomen alasque incumbentes obtegens. *Pedes* breves, robusti; femora subincrassata; tibiæ arcuatæ. *Alæ* parvæ.

Male and Female. Body broad, thick, compact. Head almost as broad as the thorax; front broad, narrower than the epistoma; face vertical.

Antennæ very short ; third joint nearly round ; arista very minutely pubescent. Thorax solid, apparently horny, very minutely pubescent ; scutellum small ; metathorax elliptical, enormously developed, covering the whole abdomen, sheltering the wings when in repose. Legs short, stout ; femora slightly incrassated ; tibiæ curved. Wings concealed beneath the metathorax.

231. *NOMBA TECTA*, n. s. *Mas et Fæm.* Nigra, obscura, antennis piceis, tarsis flavis apice nigris, alis cinereis.

Male and Female. Black, dull ; antennæ piceous ; tarsi yellow, with black tips ; wings grey ; veins black. Length of the body $1\frac{1}{2}$ – $1\frac{3}{4}$ line ; of the wings $2\frac{1}{2}$ –3 lines.

Subfam. HYDROMYZIDES, *Haliday*.

Gen. NOTIPHILA, *Fallen*.

232. *NOTIPHILA LINEOSA*, n. s. *Mas et Fæm.* Fusca, obscura, capite apud oculos linea frontali et epistomate albidis, arista plumosa, thorace lineis sex albidis, abdomine nigro segmentorum marginibus fulvis, pedibus nigris, tibiis anticis genubus tarsis halteribusque fulvis, alis cinereis.

Male and Female. Brown, dull ; head whitish about the eyes, and with a whitish line on the front ; epistoma whitish ; antennæ not near reaching the epistoma, 3rd joint elongate, arista thinly plumose ; thorax with six whitish lines, the lateral pair incomplete ; abdomen black, not longer than the thorax, hind borders of the segments tawny ; legs black, tarsi, knees, posterior tibiæ at the tips, and fore tibiæ tawny ; wings grey ; veins black ; discal transverse vein straight, upright, parted by more than its length from the border, and by full thrice its length from the prebrachial transverse ; halteres tawny. Length of the body $1\frac{3}{4}$ –2 lines ; of the wings $3\frac{1}{2}$ –4 lines.

The two following species belong to the group of which *N. Cinerea* is the type.

233. *NOTIPHILA QUADRIFASCIA*, n. s. *Fæm.* Fusca, subtus cinerea, capite antico amplo, facie convexa, antennis nigris, arista plumosa, metathorace abdominisque maculis duabus basalibus fasciisque quatuor albidis, genubus tarsisque rufescentibus, alis cinereis puncto costali nigro, halteribus testaceis.

Female. Brown, cinereous beneath ; head large and somewhat tumid in front and beneath ; face cinereous, convex ; antennæ black, very small, 3rd joint conical, arista plumose ; metathorax whitish ; abdomen with a whitish spot on each side at the base, and with four whitish bands, of which the 3rd and 4th are interrupted ; legs cinereous black, knees and tarsi reddish ; wings grey, with a black costal point at the tip of the subcostal vein ; veins black ; discal transverse vein oblique, nearly straight, parted by less than half its length from the

border, and by nearly thrice its length from the præbrachial transverse ; halteres testaceous. Length of the body $2\frac{1}{2}$ lines ; of the wings 4 lines.

234. NOTIPHILA FLAVILINEA, n. s. *Mas et Fæm.* Piceo-nigra, capite apud oculos testaceo, antennis rufescentibus, arista plumosa, abdominis segmentis flavo marginatis, alis cinereis apud costam sub-luridis, halteribus testaceis.

Male and Female. Piceous brown ; head rather paler, testaceous about the eyes ; antennæ reddish, very short, 3rd joint conical, arista plumose ; abdomen oval, not longer than the thorax ; hind borders of the segments yellow ; wings grey, with a slight lurid tinge along the costa ; veins black ; discal transverse vein straight, upright, parted by less than its length from the border, and by a little more than twice its length from the præbrachial transverse ; halteres testaceous. Length of the body $2\frac{1}{2}$ lines ; of the wings 4 lines.

Gen. EPHYDRA. *Fallen.*

235. EPHYDRA BORBOROIDES, n. s. *Fæm.* Nigra, lata, crassa, pubescens, subsetosa, antennis piceis, arista pubescente, tibiis tarsisque flavo fasciatis, alis nigricantibus latiusculis cinerascete sexguttatis.

Female. Black, broad, thick, somewhat pubescent and with a few bristles ; antennæ piceous, short, 3rd joint round, arista pubescent ; abdomen broader than the thorax ; legs rather setose, tibiæ and tarsi with yellow bands ; wings blackish, rather broad, with about six greyish dots on each ; veins black ; posterior longitudinal veins abbreviated ; discal transverse vein parted by more than twice its length from the border, and by less than its length from the præbrachial transverse. Length of the body $1\frac{1}{2}$ line ; of the wings 3 lines.

236. EPHYDRA MACULICORNIS, n. s. *Mas.* Cinereo-nigra, capite antennisque rufis, his puncto nigro, arista nuda, abdomine nigro nitente, tarsis testaceis, alis cinereis apud costam pubescentibus.

Male. Cinereous black ; head red in front and about the eyes ; antennæ red, 3rd joint round with a black point above ; arista short, simple ; abdomen oval, black, shining, not longer than the thorax ; tarsi testaceous ; wings grey, minutely pubescent along the border ; veins black ; discal transverse vein straight, oblique, parted by more than twice its length from the border and from the præbrachial transverse ; halteres piceous. Length of the body 2 lines ; of the wings 4 lines.

Gen. OCHTHERA, *Latr.*

237. OCHTHERA INNOTATA, n. s. *Fæm.* Cinereo-nigra, capite antico flavescenti-albo, pectore pedibusque cinereis, abdomine cyanescenti-nigro, alis cinereis, halteribus albidis.

Female. Cinereous black ; head yellowish white in front, silvery white hindward ; pectus and legs cinereous ; abdomen bluish black ; wings

grey; veins black; pobrachial vein forming an obtuse angle at its junction with the discal transverse vein, the latter very oblique, parted by little more than half its length from the border, and by nearly thrice its length from the præbrachial transverse; halteres whitish. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Fam. PHORIDÆ, *Haliday*.

Gen. PHORA, *Latr.*

238. PHORA BIFASCIATA, n. s. *Fœm.* Atræ, subtus flavescenti-alba, antennis fulvis, abdomine lanceolato, fasciis duabus apice pedibus halteribusque flavescenti-albis, pedibus posticis nigris basi flavescenti-albis, tarsis intermediis nigricantibus, alis cinereis.

Female. Deep black, yellowish white beneath; antennæ tawny; abdomen lanceolate, much longer than the thorax; sides elevated, a broad basal yellowish white band, and a narrower one beyond the middle, tip also yellowish white; anterior legs and halteres yellowish white, middle tarsi blackish, hind femora with the basal half yellowish white; wings cinereous, veins black, pale at the base; costal vein ending at a little beyond half the length of the wing; radial cubital, præbrachial, and pobrachial veins parallel and equally distinct. Length of the body $2-2\frac{1}{2}$ lines; of the wings 5-6 lines.

On the Zoological Geography of the Malay Archipelago. By ALFRED R. WALLACE, Esq. Communicated by CHARLES DARWIN, Esq., F.R.S. & L.S.

[Read Nov. 3rd, 1859.]

IN Mr. Sclater's paper on the Geographical Distribution of Birds, read before the Linnean Society, and published in the 'Proceedings' for February 1858, he has pointed out that the western islands of the Archipelago belong to the Indian, and the eastern to the Australian region of Ornithology. My researches in these countries lead me to believe that the same division will hold good in every branch of Zoology; and the object of my present communication is to mark out the precise limits of each region, and to call attention to some inferences of great general importance as regards the study of the laws of organic distribution.

The Australian and Indian regions of Zoology are very strongly contrasted. In one the Marsupial order constitutes the great mass of the mammalia,—in the other not a solitary marsupial animal exists. Marsupials of at least two genera (*Cuscus* and *Belideus*) are found all over the Moluccas and in Celebes; but none have

been detected in the adjacent islands of Java and Borneo. Of all the varied forms of *Quadrumana*, *Carnivora*, *Insectivora* and *Ruminantia* which abound in the western half of the Archipelago, the only genera found in the Moluccas are *Paradoxurus* and *Cervus*. The *Sciuridæ*, so numerous in the western islands, are represented in Celebes by only two or three species, while not one is found further east. Birds furnish equally remarkable illustrations. The Australian region is the richest in the world in Parrots; the Asiatic is (of tropical regions) the poorest. Three entire families of the Psittacine order are peculiar to the former region, and two of them, the Cockatoos and the Lories, extend up to its extreme limits, without a solitary species passing into the Indian islands of the Archipelago. The genus *Palæornis* is, on the other hand, confined with equal strictness to the Indian region. In the Rasorial order, the *Phasianidæ* are Indian, the *Megapodiidæ* Australian; but in this case one species of each family just passes the limits into the adjacent region. The genus *Tropidorrhynchus*, highly characteristic of the Australian region, and everywhere abundant as well in the Moluccas and New Guinea as in Australia, is quite unknown in Java and Borneo. On the other hand, the entire families of *Bucconidæ*, *Trogonidæ* and *Phyllornithidæ*, and the genera *Pericrocotus*, *Picnonotus*, *Trichophorus*, *Ixos*, in fact, almost all the vast family of Thrushes and a host of other genera, cease abruptly at the eastern side of Borneo, Java, and Bali. All these groups are common birds in the great Indian islands; they abound everywhere; they are the characteristic features of the ornithology; and it is most striking to a naturalist, on passing the narrow straits of Macassar and Lombock, suddenly to miss them entirely, together with the *Quadrumana* and *Felidæ*, the *Insectivora* and *Rodentia*, whose varied species people the forests of Sumatra, Java, and Borneo.

To define exactly the limits of the two regions where they are (geographically) most intimately connected, I may mention that during a few days' stay in the island of Bali I found birds of the genera *Copsychus*, *Megalaima*, *Tiga*, *Ploceus*, and *Sturnopastor*, all characteristic of the Indian region and abundant in Malacca, Java, and Borneo; while on crossing over to Lombock, during three months collecting there, not one of them was ever seen; neither have they occurred in Celebes nor in any of the more eastern islands I have visited. Taking this in connexion with the fact of *Cacatua*, *Tropidorrhynchus*, and *Megapodius* having their western limit in Lombock, we may consider it established that the Strait of Lombock

(only 15 miles wide) marks the limits and abruptly separates two of the great Zoological regions of the globe. The Philippine Islands are in some respects of doubtful location, resembling and differing from both regions. They are deficient in the varied Mammals of Borneo, but they contain no Marsupials. The Psittaci are scarce, as in the Indian region; the Lories are altogether absent, but there is one representative of the Cockatoos. Woodpeckers, Trogons, and the genera *Ixos*, *Copsychus*, and *Ploceus* are highly characteristic of India. *Tanysiptera* and *Megapodius*, again, are Australian forms, but these seem represented by only solitary species. The islands possess also a few peculiar genera. We must on the whole place the Philippine Islands in the Indian region, but with the remark that they are deficient in some of its most striking features. They possess several isolated forms of the Australian region, but by no means sufficient to constitute a real transition thereto.

Leaving the Philippines out of the question for the present, the western and eastern islands of the Archipelago, as here divided, belong to regions more distinct and contrasted than any other of the great zoological divisions of the globe. South America and Africa, separated by the Atlantic, do not differ so widely as Asia and Australia: Asia with its abundance and variety of large Mammals and no Marsupials, and Australia with scarcely anything but Marsupials; Asia with its gorgeous *Phasianidae*, Australia with its dull-coloured *Megapodiidae*; Asia the poorest tropical region in Parrots, Australia the richest: and all these striking characteristics are almost unimpaired at the very limits of their respective districts; so that in a few hours we may experience an amount of zoological difference which only weeks or even months of travel will give us in any other part of the world!

Moreover there is nothing in the aspect or physical character of the islands to lead us to expect such a difference; their physical and geological differences do not coincide with the zoological differences. There is a striking homogeneity in the two *halves* of the Archipelago. The great volcanic chain runs through both parts; Borneo is the counterpart of New Guinea; the Philippines closely resemble the equally fertile and equally volcanic Moluccas; while in eastern Java begins to be felt the more arid climate of Timor and Australia. But these resemblances are accompanied by an extreme zoological diversity, the Asiatic and Australian regions finding in Borneo and New Guinea respectively their highest development.

But it may be said: "The separation between these two regions is not so absolute. There *is* some transition. There *are* species and genera common to the eastern and western islands." This is true, yet (in my opinion) proves no transition in the proper sense of the word; and the nature and amount of the resemblance only shows more strongly the absolute and original distinctness of the two divisions. The exception here clearly proves the rule.

Let us investigate these cases of supposed transition. In the western islands almost the only instance of a group peculiar to Australia and the eastern islands is the *Megapodius* in North-west Borneo. Not one of the Australian forms of Mammalia passes the limits of the region. On the other hand, *Quadrumanus* occur in Celebes, Batchian, Lombock, and perhaps Timor; Deer have reached Celebes, Timor, Buru, Ceram, and Gilolo, but not New Guinea; Pigs have extended to New Guinea, probably the true eastern limit of the genus *Sus*; Squirrels are found in Celebes, Lombock, and Sumbawa: among birds, *Gallus* occurs in Celebes and Sumbawa, Woodpeckers reach Celebes, and Hornbills extend to the North-west of New Guinea. These cases of identity or resemblance in the animals of the two regions we may group into three classes; 1st, identical species; 2nd, closely allied or representative species; and 3rd, species of peculiar and isolated genera. The common Grey Monkey (*Macacus cynomolgus*) has reached Lombock, and perhaps Timor, but not Celebes. The Deer of the Moluccas seems to be a variety of the *Cervus rufus* of Java and Borneo. The Jungle Cock of Celebes and Lombock is a Javanese species. *Hirundo javanica*, *Zosterops flavus*, *Halecyon collaris*, *Eurystomus gularis*, *Macropygia phasianella*, *Merops javanicus*, *Anthreptes lepida*, *Ptilonopus melanocephala*, and some other birds appear the same in the adjacent islands of the eastern and western divisions, and some of them range over the whole Archipelago. But after reading Lyell on the various modes of dispersion of animals, and looking at the proximity of the islands, we shall feel astonished, not at such an amount of interchange of species (most of which are birds of great powers of flight), but rather that in the course of ages a much greater and almost complete fusion has not taken place. Were the Atlantic gradually to narrow till only a strait of twenty miles separated Africa from South America, can we help believing that many birds and insects and some few mammals would soon be interchanged? But such interchange would be a fortuitous mixture of faunas essentially and absolutely dissimilar, not a natural and regular transition from

one to the other. In like manner the cases of identical species in the eastern and western islands of the Archipelago are due to the gradual and accidental commingling of originally absolutely distinct faunas.

In our second class (representative species) we must place the Wild Pigs, which seem to be of distinct but closely allied species in each island; the Squirrels also of Celebes are of peculiar species, as are the Woodpeckers and Hornbills, and two Celebes birds of the Asiatic genera *Phenicophæus* and *Aeridotheres*. Now these and a few more of like character are closely allied to other species inhabiting Java, Borneo, or the Philippines. We have only therefore to suppose that the species of the western passed over to the eastern islands at so remote a period as on one side or the other to have become extinct, and to have been replaced by an allied form, and we shall have produced exactly the state of things now existing. Such extinction and such replacement we know has been continually going on. Such has been the regular course of nature for countless ages in every part of the earth of which we have geological records; and unless we are prepared to show that the Indo-Australian Archipelago was an altogether exceptional region, such must have been the course of nature here also. If these islands have existed in their present form only during one of the later divisions of the Tertiary period, and if interchange of species at very rare and distant intervals has occurred, then the fact of some identical and other closely allied species is a necessary result, even if the two regions in question had been originally peopled by absolutely distinct creations of organic beings, and there had never been any closer connexion between them than now exists. The occurrence of a limited number of representative species in the two divisions of the Archipelago does not therefore prove any true transition from one to the other.

The examples of our third class—of peculiar genera having little or no affinity with those of the adjacent islands—are almost entirely confined to Celebes, and render that island a district *per se*, in the highest degree interesting. *Cynopithecus*, a genus of Baboons, the extraordinary Babirusa and the singular ruminant *Ansa depressicornis* have nothing in common with Asiatic mammals, but seem more allied to those of Africa. A quadrumanous animal of the same genus (perhaps identical) occurs in the little island of Batavian, which forms the extreme eastern limit of the highest order of mammalia. An allied species is also said to exist in the Philippines. Now this occurrence of quadrumana in the Australian

region proves nothing whatever as regards a transition to the western islands, which, among their numerous monkeys and apes, have nothing at all resembling them. The species of Celebes and Batchian have the high superorbital ridge, the long nasal bone, the dog-like figure, the minute erect tail, the predaceous habits and the fearless disposition of the true Baboons, and find their allies nowhere nearer than in tropical Africa. The *Anoa* seems also to point towards the same region, so rich in varied forms of Antelopes.

In the class of birds, Celebes possesses a peculiar genus of Parrots (*Prioniturus*), said to occur also in the Philippines; *Meropogon*, intermediate between an Indian and an African form of Bee-eaters; and the anomalous *Scissirostrum*, which Prince Bonaparte places next to a Madagasear bird, and forms a distinct subfamily for the reception of the two. Celebes also contains a species of *Coracias*, which is here quite out of its normal area, the genus being otherwise confined to Africa and continental India, not occurring in any other part of the Archipelago. The Celebes bird is placed, in Bonaparte's 'Conspectus,' between two African species, to which therefore I presume it is more nearly allied than to those of India. Having just received Mr. Smith's Catalogue of the Hymenoptera collected during my first residence in Celebes, I find in it some facts of an equally singular nature. Of 103 species, only 16 are known to inhabit any of the western islands of the Archipelago, while 18 are identical with species of continental India, China, and the Philippine Islands, two are stated to be identical with insects hitherto known only from tropical Africa, and another is said to be most closely allied to one from the Cape.

These phenomena of distribution are, I believe, the most anomalous yet known, and in fact altogether unique. I am aware of no other spot upon the earth which contains a number of species, in several distinct classes of animals, the nearest allies to which do not exist in any of the countries which on every side surround it, but which are to be found only in another primary division of the globe, separated from them all by a vast expanse of ocean. In no other case are the species of a genus or the genera of a family distributed in *two* distinct areas separated by countries in which they do not exist; so that it has come to be considered a law in geographical distribution, "that both species and groups inhabit continuous areas."

Facts such as these can only be explained by a bold acceptance of vast changes in the surface of the earth. They teach us that this island of Celebes is more ancient than most of the islands

now surrounding it, and obtained some part of its fauna before they came into existence. They point to the time when a great continent occupied a portion at least of what is now the Indian Ocean, of which the islands of Mauritius, Bourbon, &c. may be fragments, while the Chagos Bank and the Keeling Atolls indicate its former extension eastward to the vicinity of what is now the Malayan Archipelago. The Celebes group remains the last eastern fragment of this now submerged land, or of some of its adjacent islands, indicating its peculiar origin by its zoological isolation, and by still retaining a marked affinity with the African fauna.

The great Pacific continent, of which Australia and New Guinea are no doubt fragments, probably existed at a much earlier period, and extended as far westward as the Moluccas. The extension of Asia as far to the south and east as the Straits of Macassar and Lombok must have occurred subsequent to the submergence of both these great southern continents; and the breaking up and separation of the islands of Sumatra, Java, and Borneo has been the last great geological change these regions have undergone. That this has really taken place as here indicated, we think is proved by the following considerations. Not more than twenty (probably a smaller number) out of about one hundred land birds of Celebes at present known are found in Java or Borneo, and only one or two of twelve or fifteen Mammalia. Of the Mammalia and birds of Borneo, however, at least three-fourths, probably five-sixths, inhabit also Java, Sumatra, or the peninsula of Malacca. Now, looking at the direction of the Macassar Straits running nearly north and south, and remembering we are in the district of the monsoons, a steady south-east and north-west wind blowing alternately for about six months each, we shall at once see that Celebes is more favourably situated than any other island to receive stray passengers from Borneo, whether drifted across the sea or wafted through the air. The distance too is less than between any of the other large islands; there are no violent currents to neutralize the action of the winds; and numerous islets in mid-channel offer stations which might rescue many of the wanderers, and admit, after repose, of fresh migrations. Between Java and Borneo the width of sea is much greater, the intermediate islands are fewer, and the direction of the monsoons *along* and not *across* the Java sea, accompanied by alternating currents in the same direction, must render accidental communication between the two islands exceedingly difficult; so that where the facilities for intercommunication are greatest, the number of species common to the two

countries is least, and *vice versâ*. But again, the mass of the species of Borneo, Java, &c., even when not *identical* are *congeneric*, which, as before explained, indicates *identity* at an earlier epoch; whereas the great mass of the fauna of Celebes is widely different from that of the western islands, consisting mostly of genera, and even of entire families, altogether foreign to them. This clearly points to a former total diversity of forms and species,—existing similarities being the result of intermixture, the extreme facilities for which we have pointed out. In the case of the great western islands a former more complete identity is indicated, the present differences having arisen from their isolation during a considerable period, allowing time for that partial extinction and introduction of species which is the regular course of nature. If the very small number of western species in Celebes is all that the most favourable conditions for transmission could bring about, the complete similarity of the faunas of the western islands could never (with far less favourable conditions) have been produced by the same means. And what other means can we conceive but the former connexion of those islands with each other and with the continent of Asia?

In striking confirmation of this view we have physical evidence of a very interesting nature. These countries are in fact *still connected*, and that so completely that an elevation of only 300 feet would nearly double the extent of tropical Asia. Over the whole of the Java Sea, the Straits of Malacca, the Gulf of Siam, and the southern part of the China Sea, ships can anchor in less than fifty fathoms. A vast submarine plain unites together the apparently disjointed parts of the Indian zoological region, and abruptly terminates, exactly at its limits, in an unfathomable ocean. The deep sea of the Moluccas comes up to the very coasts of Northern Borneo, to the Strait of Lomboek in the south, and to near the middle of the Strait of Macassar. May we not therefore from these facts very fairly conclude that, according to the system of alternate bands of elevation and depression that seems very generally to prevail, the last great rising movement of the volcanic range of Java and Sumatra was accompanied by the depression that now separates them from Borneo and from the continent?

It is worthy of remark that the various islands of the Moluccas, though generally divided by a less extent of sea, have fewer species in common; but the separating seas are in almost every case of immense depth, indicating that the separation took place at a much earlier period. The same principle is well illustrated by the dis-

tribution of the genus *Paradisea*, two species of which (the common Birds of Paradise) are found only in New Guinea and the islands of Aru, Mysol, Waigiou, and Jobie, all of which are connected with New Guinea by banks of soundings, while they do not extend to Ceram or the Ké Islands, which are no further from New Guinea, but are separated from it by deep sea. Again, the chain of small volcanic islands to the west of Gilolo, though divided by channels of only ten or fifteen miles wide, possess many distinct representative species of insects, and even, in some cases, of birds also. The Baboons of Batchian have not passed to Gilolo, a much larger island, only separated from it by a channel ten miles wide, and in one part almost blocked up with small islands.

Now looking at these phenomena of distribution, and especially at those presented by the fauna of Celebes, it appears to me that a much exaggerated effect, in producing the present distribution of animals, has been imputed to the accidental transmission of individuals across intervening seas; for we have here as it were a test or standard by which we may measure the possible effect due to these causes, and we find that, under conditions perhaps the most favourable that exist on the globe, the percentage of species derived from this source is extremely small. When my researches in the Archipelago are completed, I hope to be able to determine with some accuracy this numerical proportion in several cases; but in the mean time we will consider 20 per cent. as the probable maximum for birds and mammals which in Celebes have been derived from Borneo or Java.

Let us now apply this standard to the case of Great Britain and the Continent, in which the width of dividing sea and the extent of opposing coasts are nearly the same, but in which the species are almost all identical,—or to Ireland, more than 90 per cent. of whose species are British,—and we shall at once see that no theory of transmission across the present Straits is admissible, and shall be compelled to resort to the idea of a very recent separation (long since admitted), to account for these zoological phenomena.

It is, however, to the oceanic islands that we consider the application of this test of the most importance. Let any one try to realize the comparative facilities for the transmission of organized beings across the Strait of Macassar from Borneo to Celebes, and from South Europe or North Africa to the island of Madeira, at least four times the distance, and a mere point in the ocean, and he would probably consider that in a given period a hundred cases of transmission would be more likely to occur in the former case

than one in the latter. Yet of the comparatively rich insect-fauna of Madeira, 40 per cent. are continental species ; and of the flowering plants more than 60 per cent. The Canary Islands offer nearly similar results. Nothing but a former connexion with the Continent will explain such an amount of specific identity (the weight of which will be very much increased if we take into account the representative species) ; and the direction of the Atlas range towards Teneriffe, and of the Sierra Nevada towards Madeira, are material indications of such a connexion.

The Galapagos are no further from South America than Madeira is from Europe, and, being of greater extent, are far more liable to receive chance immigrants ; yet they have hardly a species identical with any inhabiting the American continent. These islands therefore may well have originated in mid-ocean ; or if they ever were connected with the mainland, it was at so distant a period that the natural extinction and renewal of species has left not one in common. The character of their fauna, however, is more what we should expect to arise from the chance introduction of a very few species at distant intervals ; it is very poor ; it contains but few genera, and those scattered among unconnected families ; its genera often contain several closely allied species, indicating a single antitype.

The fauna and flora of Madeira and of the Canaries, on the other hand, have none of this chance character. They are comparatively rich in genera and species ; most of the principal groups and families are more or less represented ; and, in fact, these islands do not differ materially, as to the general character of their animal and vegetable productions, from any isolated mountain in Europe or North Africa of about equal extent.

On exactly the same principles, the very large number of species of plants, insects, and birds, in Europe and North America, either absolutely identical or represented by very closely allied species, most assuredly indicates that some means of land communication in temperate or sub-arctic latitudes existed at no very distant geological epoch ; and though many naturalists are inclined to regard all such views as vague and unprofitable speculations, we are convinced they will soon take their place among the legitimate deductions of science.

Geology can detect but a portion of the changes the surface of the earth has undergone. It can reveal the past history and mutations of what is now dry land ; but the ocean tells nothing of her bygone history. Zoology and Botany here come to the aid of

their sister science, and by means of the humble weeds and despised insects inhabiting its now distant shores, can discover some of those past changes which the ocean itself refuses to reveal. They can indicate, approximately at least, where and at what period former continents must have existed, from what countries islands must have been separated, and at how distant an epoch the rupture took place. By the invaluable indications which Mr. Darwin has deduced from the structure of coral reefs, by the surveys of the ocean-bed now in progress, and by a more extensive and detailed knowledge of the geographical distribution of animals and plants, the naturalist may soon hope to obtain some idea of the continents which have now disappeared beneath the ocean, and of the general distribution of land and sea at former geological epochs.

Most writers on geographical distribution have completely overlooked its connexion with well-established geological facts, and have thereby created difficulties where none exist. The peculiar and apparently endemic faunæ and floræ of the oceanic islands (such as the Galapagos and St. Helena) have been dwelt upon as something anomalous and inexplicable. It has been imagined that the more simple condition of such islands would be to have their productions identical with those of the nearest land, and that their actual condition is an incomprehensible mystery. The very reverse of this is however the case. We really require no speculative hypothesis, no new theory, to explain these phenomena; they are the logical results of well-known laws of nature. The regular and unceasing extinction of species, and their replacement by allied forms, is now no hypothesis, but an established fact; and it necessarily produces such peculiar faunæ and floræ in all but recently formed or newly disrupted islands, subject of course to more or less modification according to the facilities for the transmission of fresh species from adjacent continents. Such phenomena therefore are far from uncommon. Madagascar, Mauritius, the Moluccas, New Zealand, New Caledonia, the Pacific Islands, Juan Fernandez, the West India Islands, and many others, all present such peculiarities in greater or less development. It is the instances of identity of species in distant countries that presents the real difficulty. What was supposed to be the more normal state of things is really exceptional, and requires some hypothesis for its explanation. The phenomena of distribution in the Malay Archipelago, to which I have here called attention, teach us that, however narrow may be the strait separating an island from its con-

continent, it is still an impassable barrier against the passage of any considerable number and variety of land animals; and that in all cases in which such islands possess a tolerably rich and varied fauna of species mostly identical, or closely allied with those of the adjacent country, we are forced to the conclusion that a geologically recent disruption has taken place. Great Britain, Ireland, Sicily, Sumatra, Java and Borneo, the Aru Islands, the Canaries and Madeira, are cases to which the reasoning is fully applicable.

In his introductory Essay on the Flora of New Zealand, Dr. Hooker has most convincingly applied this principle to show the former connexion of New Zealand and other southern islands with the southern extremity of America; and I will take this opportunity of calling the attention of zoologists to the very satisfactory manner in which this view clears away many difficulties in the distribution of animals. The most obvious of these is the occurrence of Marsupials in America only, beyond the Australian region. They evidently entered by the same route as the plants of New Zealand and Tasmania which occur in South temperate America, but having greater powers of dispersion, a greater plasticity of organization, have extended themselves over the whole continent though with so few modifications of form and structure as to point to a unity of origin at a comparatively recent period. It is among insects, however, that the resemblances approach in number and degree to those exhibited by plants. Among Butterflies the beautiful *Heliconidæ* are strictly confined to South America, with the exception of a single genus (*Hamadryas*) found in the Australian region from New Zealand to New Guinea. In Coleoptera many families and genera are characteristic of the two countries; such are *Pseudomorphidæ* among the Geodephaga, *Lamprimidæ* and *Syndesidæ* among the Lucani, *Anoplognathidæ* among the Lamellicornes, *Stigmoderidæ* among the Buprestes, *Natalis* among the Cleridæ, besides a great number of representative genera. This peculiar distribution has hitherto only excited astonishment, and has confounded all ideas of unity in the distribution of organic beings; but we now see that they are in exact accordance with the phenomena presented by the flora of the same regions, as developed in the greatest detail by the researches of Dr. Hooker.

It is somewhat singular, however, that not one *identical species* of insect should yet have been discovered, while no less than 89 species of flowering plants are found both in New Zealand and South America. The relations of the animals and of the plants

of these countries must necessarily depend on the same physical changes which the Southern hemisphere has undergone; and we are therefore led to conclude that insects are much less persistent in their specific forms than flowering plants, while among Mammalia and land birds (in which no genus even is common to the countries in question) species must die and be replaced much more rapidly than in either. And this is exactly in accordance with the fact (well established by geology) that at a time when the shells of the European seas were almost all identical with species now living, the European Mammalia were almost all different. The duration of life of species would seem to be in an inverse proportion to their complexity of organization and vital activity.

In the brief sketch I have now given of this interesting subject, such obvious and striking facts alone have been adduced as a traveller's note-book can supply. The argument must therefore lose much of its weight from the absence of detail and accumulated examples. There is, however, such a very general accordance in the phenomena of distribution as separately deduced from the various classes or kingdoms of the organic world, that whenever one class of animals or plants exhibits in a clearly marked manner certain relations between two countries, the other classes will certainly show similar ones, though it may be in a greater or a less degree. Birds and insects will teach us the same truths; and even animals and plants, though existing under such different conditions, and multiplied and dispersed by such a generally distinct process, will never give conflicting testimony, however much they may differ as regards the amount of relationship between distant regions indicated by them, and consequently notwithstanding the greater or less weight either may have in the determining of questions of this nature.

This is my apology for offering to the Linnean Society the present imperfect outline in anticipation of the more detailed proofs and illustrations which I hope to bring forward on a future occasion.

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